DIESEL PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR

FIVE DOLLARS PER YEAR

OCTOBER, 1954

FIFTY CENTS PER COPY

GOOD EXAMPLE OF LOW COST DIESEL OPERATI

WA

PAG

THE REPORT from a South D
(name on request) states that, for 14 years
lubricated 1,500 h.p. Nordberg diesel was
96 per cent of the time—a total of 117,9
hours—with never a stuck ring, and lube
consumption consistently low. Average lu
tion, for example, one gallon per 4,855 h.p
consumption: one gallon per 12.16 kwh ge

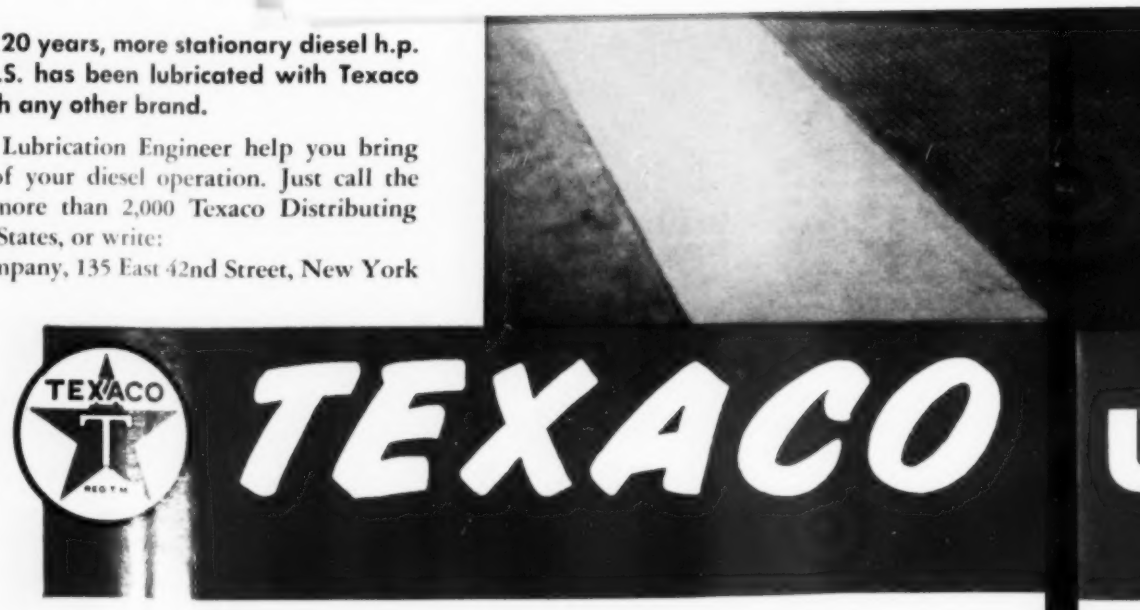
This is outstanding performance—the kin
operators have come to expect from engin
with Texaco.

For diesel, gas and dual-fuel engines there
Texaco Ursa Oil series— all especially refi
engines deliver *more power* with *less fuel*
periods between overhauls. They are appro
ing engine builders and are preferred by ope
where. In fact—

For over 20 years, more stationary diesel h.p. in the U.S. has been lubricated with Texaco than with any other brand.

Let a Texaco Lubrication Engineer help you bring down the cost of your diesel operation. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.



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TEXACO STAR THEATER
starring JIMMY DURANTE
or DONALD O'CONNOR
on television
. . . Saturday nights, NBC

AVY

GES

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

GOOD EXAMPLE OF LOW COST DIESEL OPERATION . . .

THE REPORT from a South Dakota plant (name on request) states that, for 14 years, this Texaco-lubricated 1,500 h.p. Nordberg diesel was in service for 96 per cent of the time—a total of 117,935 operating hours—with never a stuck ring, and lube oil and fuel consumption consistently low. Average lube consumption, for example, one gallon per 4,855 h.p. hours. Fuel consumption: one gallon per 12.16 kwh generated.

This is outstanding performance—the kind that diesel operators have come to expect from engines lubricated with Texaco.

For diesel, gas and dual-fuel engines there is a complete *Texaco Ursa Oil* series— all especially refined to make engines deliver *more power* with *less fuel* over *longer periods* between overhauls. They are approved by leading engine builders and are preferred by operators everywhere. In fact—

For over 20 years, more stationary diesel h.p. in the U.S. has been lubricated with Texaco than with any other brand.

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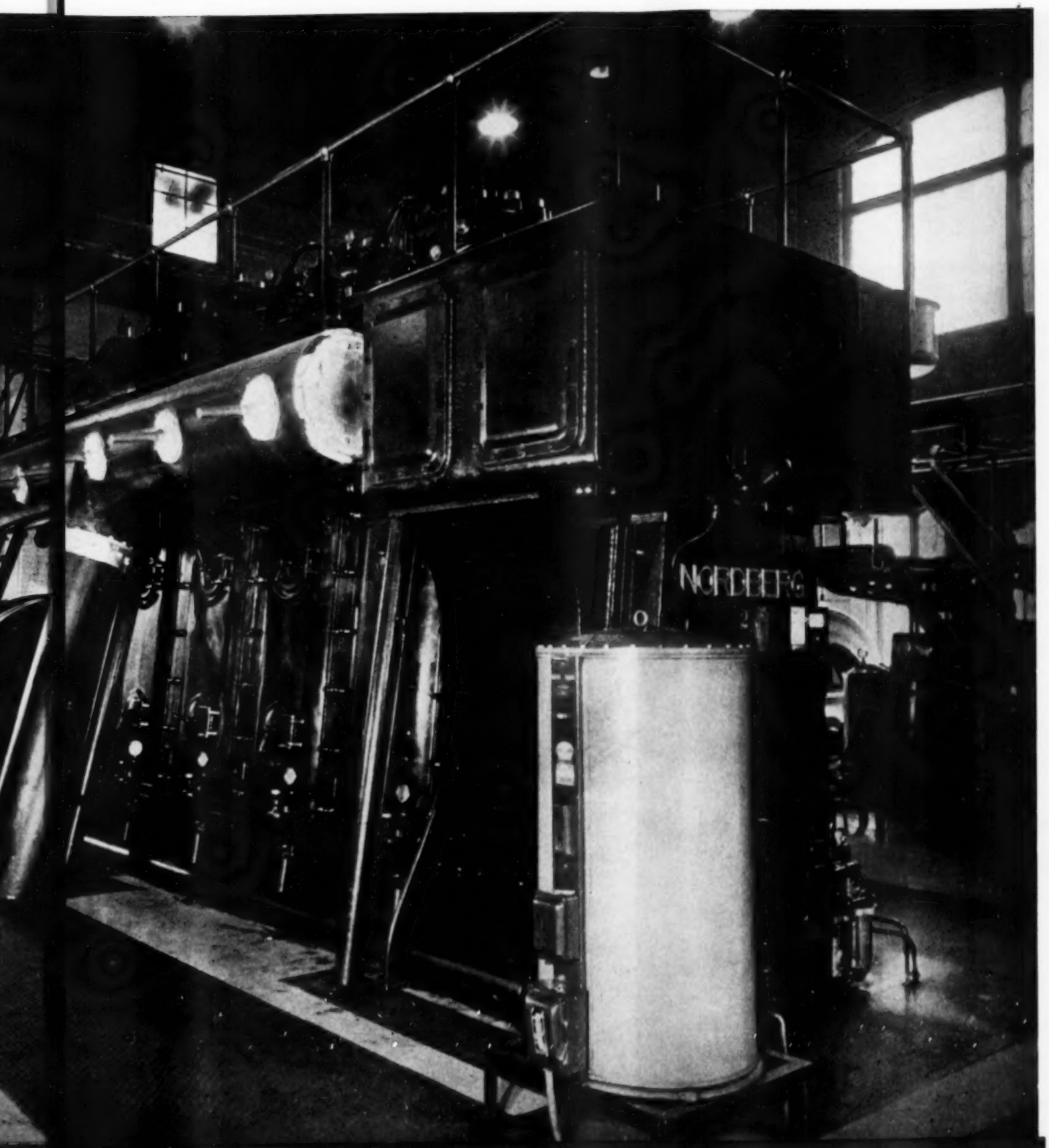
TEXACO

TEXACO



URSA OILS

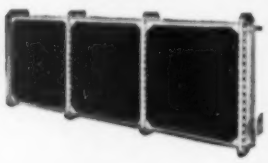
FOR ALL DIESEL, GAS
AND DUAL-FUEL ENGINES

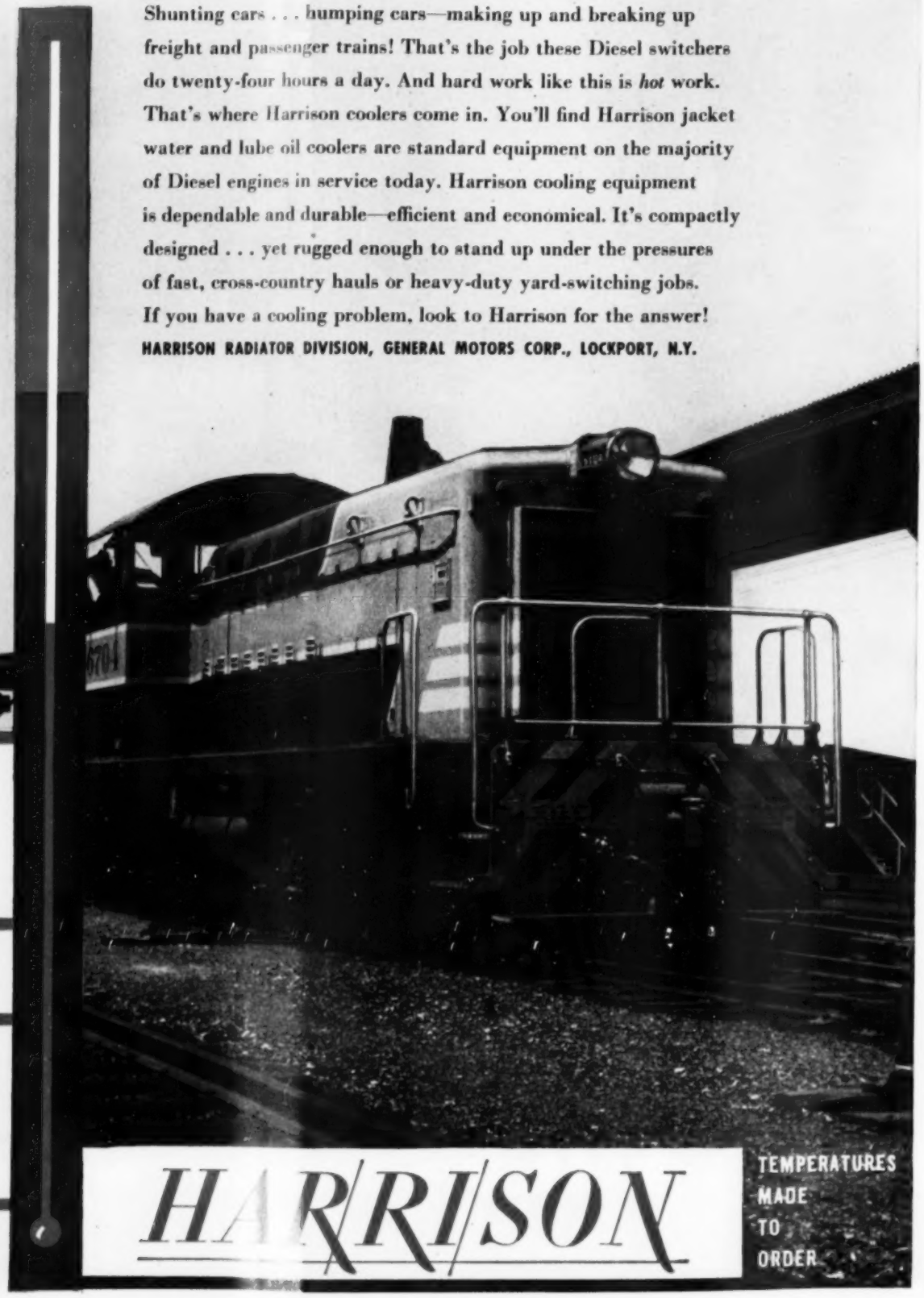
SWITCHER THAT NEVER SWELTERS!

Shunting cars . . . humping cars—making up and breaking up freight and passenger trains! That's the job these Diesel switchers do twenty-four hours a day. And hard work like this is *hot* work. That's where Harrison coolers come in. You'll find Harrison jacket water and lube oil coolers are standard equipment on the majority of Diesel engines in service today. Harrison cooling equipment is dependable and durable—efficient and economical. It's compactly designed . . . yet rugged enough to stand up under the pressures of fast, cross-country hauls or heavy-duty yard-switching jobs. If you have a cooling problem, look to Harrison for the answer!

HARRISON RADIATOR DIVISION, GENERAL MOTORS CORP., LOCKPORT, N.Y.

Harrison lube oil cooler and jacket water cooler for Diesel locomotive engines.





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TEMPERATURES MADE TO ORDER

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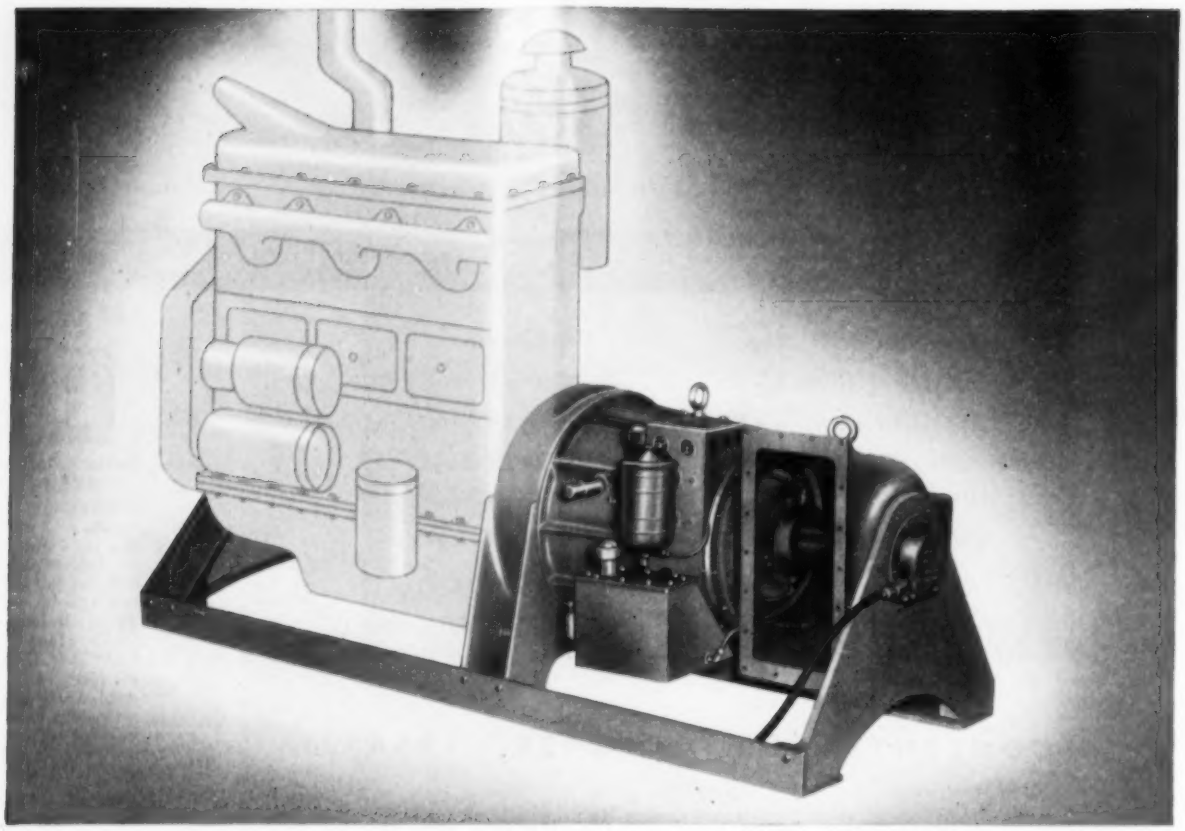
FRONT COVER ILLUSTRATION

The General Motors section of the Reynolds Metals power plant at Corpus Christi. The entire section houses 41 spark ignition natural gas engines, Model 16-358 Cleveland diesel engines. Each is a two-cycle, 12½ by 14¼ power plant delivering 2000 kw. at 375 rpm.



Up to 1/3 more work with Torque Converter Drive

A new power unit represents a major investment.

That's why it's so important that you get peak production and performance from it . . . with longest possible operating life . . . by equipping it with Torque Converter Drive.

With the Twin Disc Three-Stage Torque Converter design, here are a few of the advantages you will obtain: 1 Through *fluid* connection, with the *highest* torque multiplication available (up to 6:1 at stall), you'll *eliminate* overloading, lugging, or stalling. 2 Your engines will operate in *maximum* efficiency range at all times, with *more horsepower put to work*. 3 Power will *automatically* be matched to load demands. 4 Heavy loads will be picked up *smoothly*, without slipping the clutch. 5 Shock loads will be *absorbed*, saving engines, clutches, and drive line components. 6 With an *infinite* variety of ratios available, you'll get *accurate, positive* control . . . permitting delicate "inching" or "holding" under power.

Today, throughout the construction industry . . . on power shovels, draglines, cranes, hoists, crawler tractors, heavy-duty trucks, industrial locomotives . . . owners of powered equipment as well as major equipment manufacturers are proving the quickest way to increase production volume—speed work cycles, provide easier operation, and assure longer equipment life—is to install Twin Disc Torque Converter Drive.

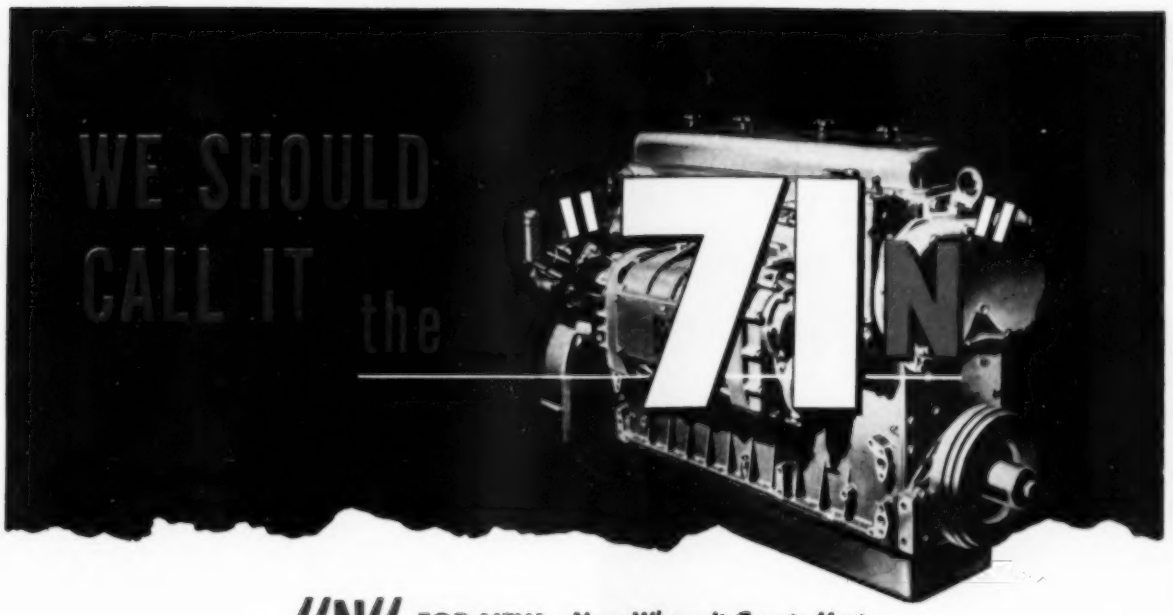
Talk to your engine dealer—or write *now* to Twin Disc Clutch Company, Hydraulic Division, Rockford, Ill.—and get the *complete* story.

Three Series, or sizes, are provided —the 10,000, 11,500, and 16,000— with seven capacities in each size through internal blading variations. As a result, your power unit can be equipped with a Twin Disc Three-Stage Torque Converter with the *exact* horsepower capacity required for greatest possible efficiency.

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin
Hydraulic Division, Rockford, Illinois



"N" FOR NEW—*New Where It Counts Most*

You don't have to be an old-timer to remember when the first General Motors Series 71 Diesel was introduced. We called it the "71" in 1938 and we call it the "71" today.

But in 17 years these design improvements from top to bottom have given operators higher horsepower, lower fuel consumption and longer engine life. And now, a whole series of new improvements has made this fast-stepping, compact, 2-cycle Diesel better than ever.

NEW **17 TO 1 COMPRESSION** gives better fuel economy, squeezing more power from every gallon of fuel.

NEW **"FIGURE 8" CYLINDER LINERS** give you a cleaner burning, more efficient engine. Air intake area is increased 32% for more complete fuel burning and better exhaust.

NEW **IMPROVEMENTS IN PISTON PIN, PIN RETAINER AND CAM FOLLOWER DESIGN** mean longer life, less maintenance cost. High-valve unit injectors last longer because the valve assembly is away from high cylinder temperature areas. Hard-chrome steel "Lite-Tite" piston rings resist wear; are tougher and more flexible and give many more hours of service.

And—best of all—in your next overhaul you can incorporate any or all of these new improvements in any GM Series 71 Diesel engine you're operating today. "The Inside Story" tells you how these new improvements can help cut your costs and speed your jobs. Mail the coupon today for your copy.

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines . . . 30 to 300 H.P. • Multiple Units . . . Up to 893 H.P.

It Pays to STANDARDIZE on GM DIESEL POWER

Write For Booklet

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Detroit 28, Michigan

Please send me booklet "The Inside Story"

Name: _____
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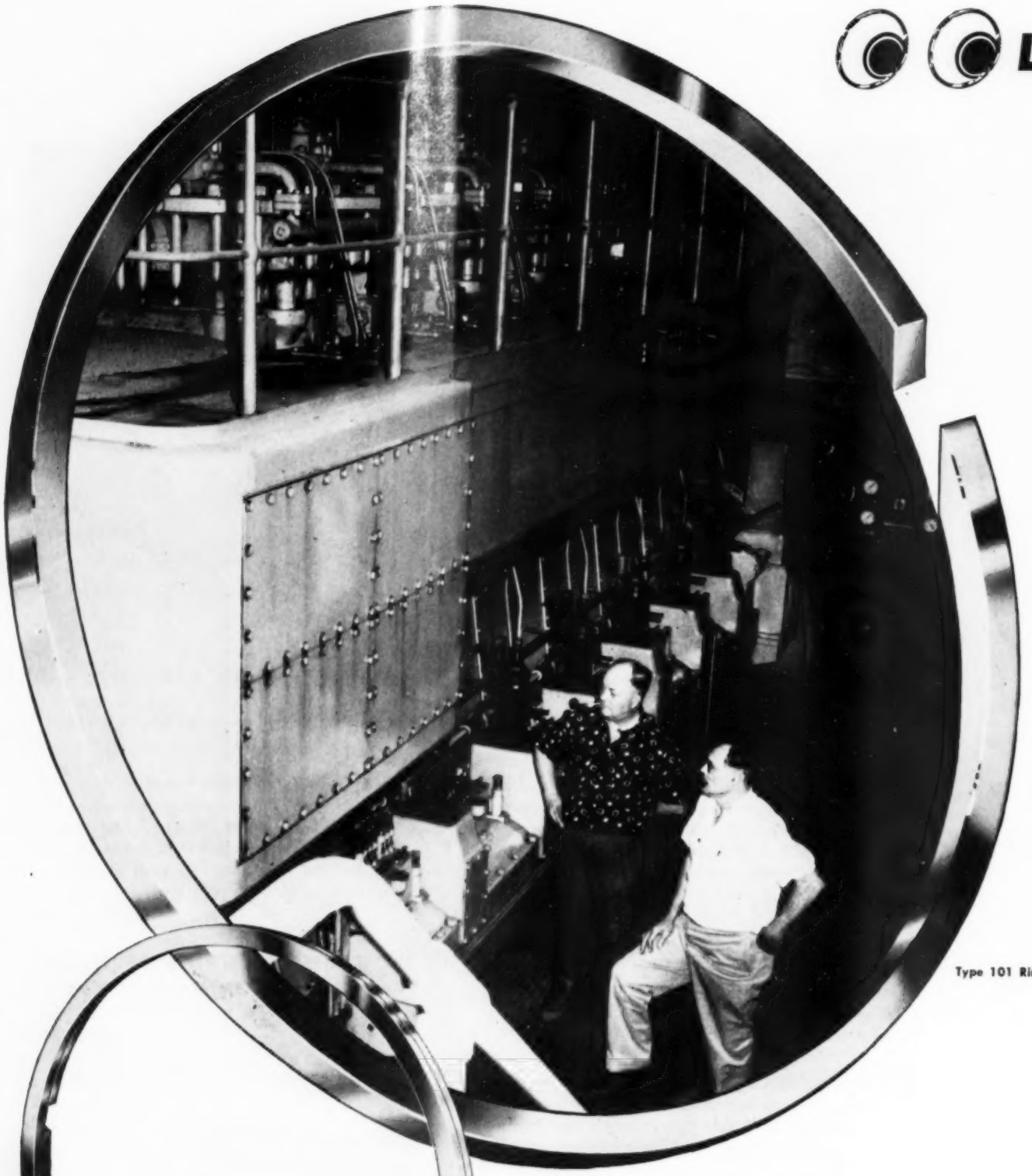
Look to



Type 101 Ring

Cooklite Ring

RE-TURNING MAKES BETTER RINGS!

Because they are re-turned as a final manufacturing process, Cook Piston Rings are light-tight, and conform perfectly to the cylinder wall. This eliminates the possibility of scuffing during initial operation. The perfect conformity of re-turned Cook Rings prevents hot gasses from blowing by and impairing lubrication when it is needed most. The result — *longer life and more efficient performance!*

ok to COOK for Better Rings!

COOK PISTON RINGS
Save Key West $41,670,
on ONE 2400-HP Diesel Engine!

2400-HP DIESEL ENGINE	OPERATING WITH BRAND "X" RINGS	COOKTITE SEALING RING COMBINATION
Total hours operated with each brand — average of all cylinders —	10,700	44,842
Rate of cyl. wear per 1000 hours' operation —	.00148"	.00024"
Ring cost per 1000 hours' operation —	$161.00	$59.00
Hours operated — average per piston — pulling job —	2627	4061
Total generator output — kwhrs —	12,596,100	59,094,900
Average kwhrs/gal. fuel consumed —	12.17	12.77
Gal. fuel saved a/c increased efficiency with Cook Rings —		228,149
Total saving on fuel @ 11c per gal. —		$25,096.00
Total saving a/c reduced cyl. wear rate with Cook Rings (1 set liners) —		12,000.00
Saving on ring cost — $102.00 per 1000 hours for 44,800 hours in favor of Cook Rings —		4,574.00
Total saving in favor of Cooktite Sealing Ring Combination		$41,670.00

HERE'S $41,000 worth of reasons why the Key West Electric System uses Cook Piston Rings *exclusively*, in all its Diesel engines. It's the performance record of their No. 12 unit — a 2400-HP engine which after 55,542 hours, had racked up the savings shown above.

Exceptional performance? Yes, but it's also *typical*. Read what Key West Electric System's Chief Engineer, L. W. Whitmarsh, has to say about Cook Piston Rings:

> *"Proportionately, the same economies have been obtained from the use of Cook Piston Rings in all of our other engines, which accounts for our continuing to use them exclusively."*

Use the coupon for full product information and the name of your nearby Cook representative. C. Lee Cook Mfg. Co., Inc., Louisville 3, Ky.

C. LEE COOK
MANUFACTURING CO.
Sealing Pressures Since 1888

C. Lee Cook Manufacturing Co.
914 South 8th Street
Louisville 3, Kentucky

Gentlemen: Please send me complete information on Cook Piston Rings and name of nearest representative.

Firm_____

Street_____

City_____ State_____

Attention:_____

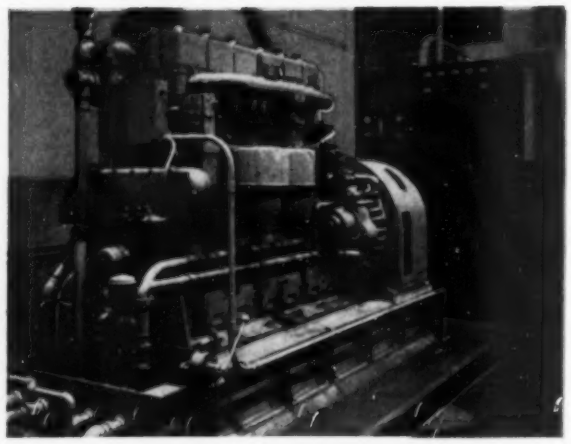
Type of Units_____

"Round-the-clock" production guarded by **SUPERIOR**-powered standby generator

To maintain safe levels of illumination, keep plant communications working, and supply power for the fire alarm system and stationary fire equipment are the main objectives assigned to the newly installed standby electrical system at North American Aviation's Columbus, Ohio, plant.

Heart of this system is National Supply's heavy-duty Superior 6G-510 gas engine, rated at 295 BHP for 900 RPM operation of a 200 KW Elliot generator. Because of the plant's size—nearly 300 acres—and the scope of manufacturing operations—17,000 employees on "round-the-clock" production schedules—the dependability and performance of this standby generator is vitally important.

Whatever your power generation requirements, be sure to have the profitable facts of National Supply's complete line (4 to 1765 HP) of Superior, Atlas and Lister diesel engines for power generation. Write or call the nearest sales and service point listed below.



DIESEL DUAL FUEL GAS — THE NATIONAL SUPPLY COMPANY — ATLAS Imperial DIESEL ENGINES — Superior ENGINES — DISTRIBUTOR OF Lister DIESELS IN U.S.A.

THE NATIONAL SUPPLY COMPANY

ENGINE DIVISION PLANT AND GENERAL OFFICES: SPRINGFIELD, OHIO

SALES AND SERVICE POINTS: Gloucester, Massachusetts • Houston, Texas • Fort Worth, Texas • San Diego, California Oakland, California • Terminal Island, California • Ketchikan, Alaska • Washington, D.C. • Chicago, Illinois • Portland, Oregon • Astoria, Oregon • Casper, Wyoming • Halifax, Nova Scotia • Vancouver, B.C. • Toronto, Ontario • Park Rapids, Minnesota • New York, New York • Seattle, Washington • New Orleans, Louisiana • Pittsburgh, Pennsylvania

THE ENGINEER'S REPORT

DATA

LUBRICANT RPM Delo Oil R.R.

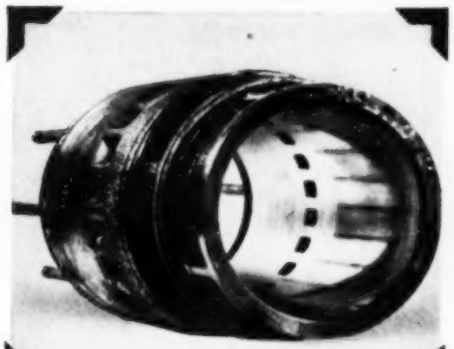
UNIT Diesel locomotive

SERVICE Mountain freight haul

CONDITIONS Long, continuous grades to 1.6%

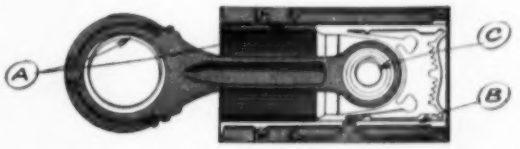
FIRM The Milwaukee Road

333,590 freight miles—only 0.0035 inch liner wear!



LUBRICATED WITH RPM DELO OIL R.R., this representative cylinder assembly was in good condition when pulled for regular inspection after 333,590 actual freight miles. Operation was on The Milwaukee Road's tough run between Othello, Washington, and Avery, Idaho. This liner, shown as it came from the engine, miked only 0.0035 inch wear, 0.001 inch taper, despite hard operating conditions—heavy loads, wide temperature variations, heavy grades, including one stretch of 20 miles of continuous 1.6 percent. Neither wristpin or bushing showed measurable wear.

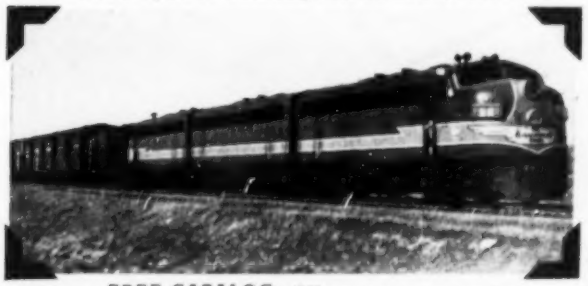
How RPM DELO Oil R.R. prevents wear, corrosion, oxidation



A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.



FREE CATALOG: "How to Save Money on Equipment Operation," a booklet full of valuable information, will be sent you on request to Standard Oil Company of California, 225 Bush St., San Francisco, Calif.

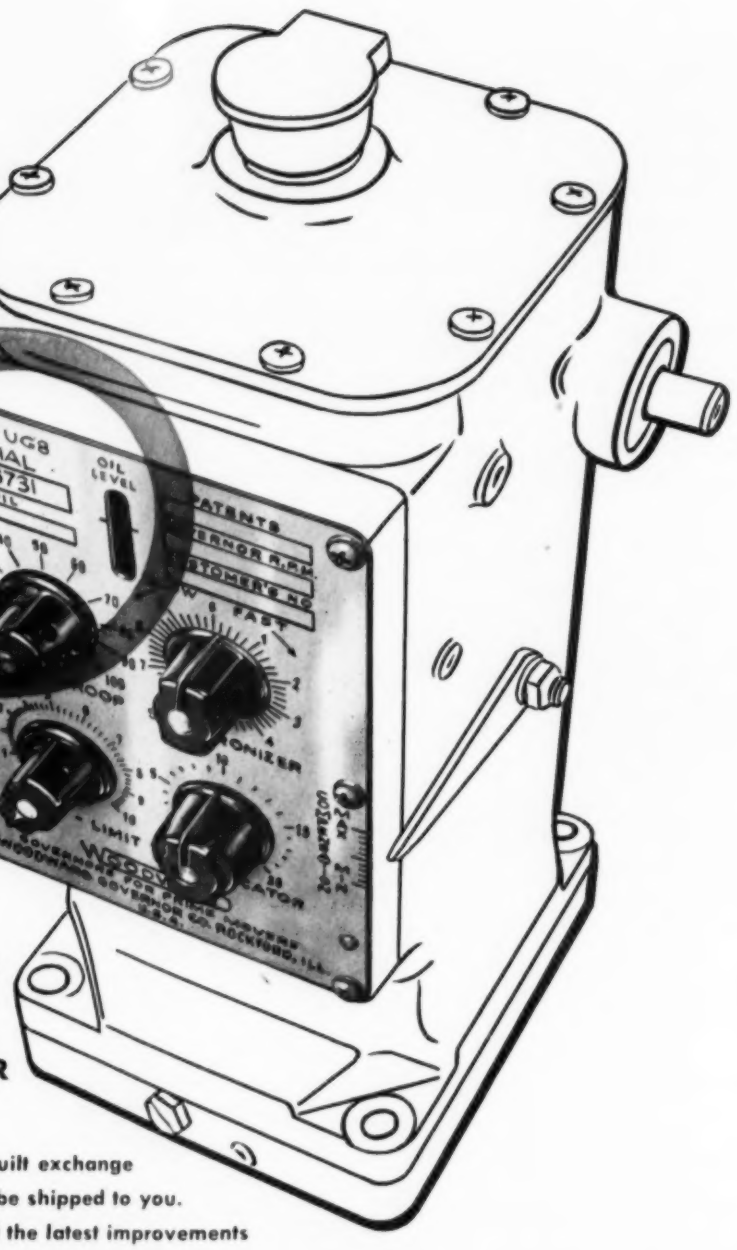
RPM DELO LUBRICATING OILS

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

GOVERNOR EXCHANGE



JUST SEND US THE SERIAL NUMBER

A factory re-built exchange governor will be shipped to you. It will have all the latest improvements and carry the same guarantee as a new governor. We can, in an emergency, usually provide one day service from the stock of governors we keep on hand. Or if you prefer send your governor to us for overhaul and modernization in our shop.

World's oldest and largest manufacturer of hydraulic governors for prime movers

WOODWARD GOVERNOR COMPANY

ROCKFORD, ILLINOIS

Good Tips are mighty important!

Tests by a leading railroad show improperly cleaned spray tips caused 11% drop in horsepower, 1.7% efficiency loss in one year.

Proper maintenance of equipment is a major problem for any railroad, and much time, effort and money are expended to keep power plants functioning at peak efficiency.

Even the smallest type of equipment such as the spray tips on your fuel injection equipment can cause serious efficiency losses unless properly maintained, as evidenced by recent tests made by one of America's leading railroads.

To assure that operators get full performance out of Bendix Fuel Injection Equipment, we have prepared a special folder showing the best proven method of maintaining the original high polish on spray tips in order to reduce carbon deposits to a minimum.

Send today for your copy of the Bendix bulletin, "How To Clean Spray Tips".

SCINTILLA DIVISION OF Bendix
AVIATION CORPORATION
SIDNEY, NEW YORK

BENDIX*
FUEL INJECTION EQUIPMENT

*REG. U.S. PAT. OFF.

Western Office: 582 Market Street, San Francisco 4, California
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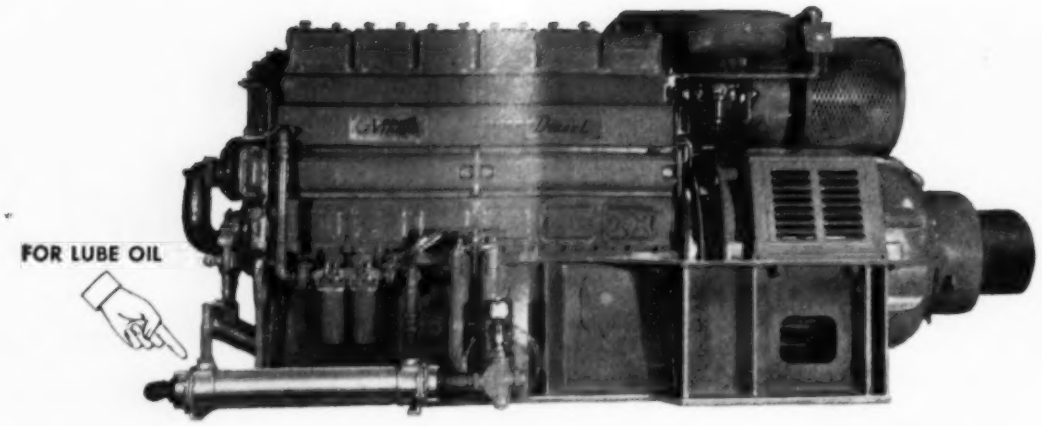
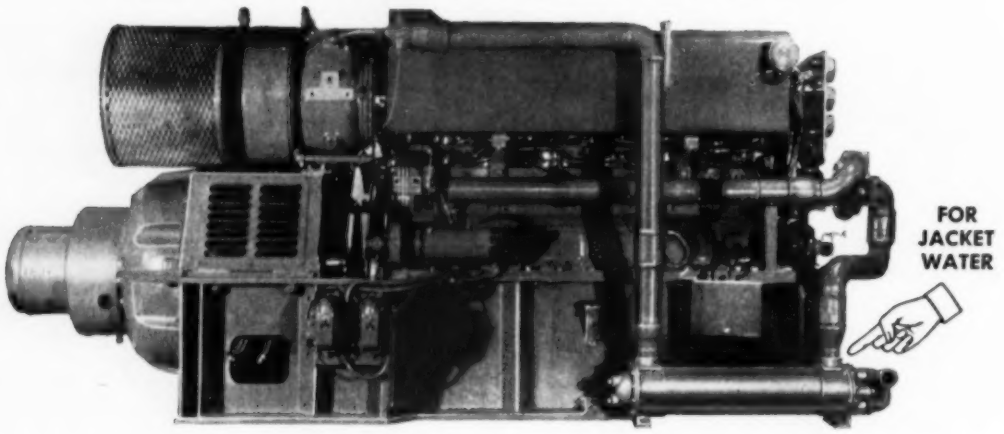


TO INSURE CORRECT OPERATING TEMPERATURES
this Sterling Viking Diesel comes equipped with
2 ROSS EXCHANGERS



Driving a 400 kw generator at 1200 rpm, this 6-cylinder Sterling Viking Supercharged Diesel is designed for continuous duty or standby service.

To maintain correct operating temperatures at all times, it is equipped with two Ross Type BCF Exchangers: One cools the lube oil. The other cools the jacket water. *Overheating is prevented!*

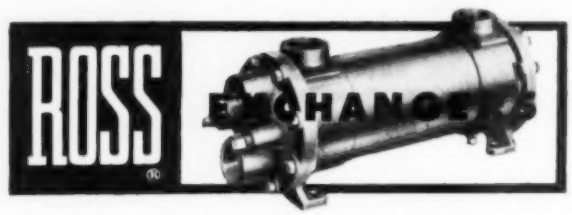
Says Sterling Engine Company, "Ross Exchangers are well-constructed and perform efficiently . . . Kewanee-Ross provides excellent engineering cooperation."

Voicing similar reasons for Ross Exchanger selection, numerous other prime equipment builders regularly install these compact, copper alloy units on engines, compressors, turbines, reduction gears, speed increasers and torque converters . . . to cool lube oil, jacket water and hydraulic fluid.

Pre-engineered and fully standardized, Ross Type BCF Exchangers are top-rated for ruggedness and thermal efficiency. Stocked in a wide range of sizes, they are promptly available to fulfill most requirements.

For more information, request Bulletin 1.1K5.

KEWANEE-ROSS CORPORATION
DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION
1425 WEST AVENUE • BUFFALO 13, N. Y.
In Canada: Kewanee-Ross of Canada Limited, Toronto 5, Ont.



Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

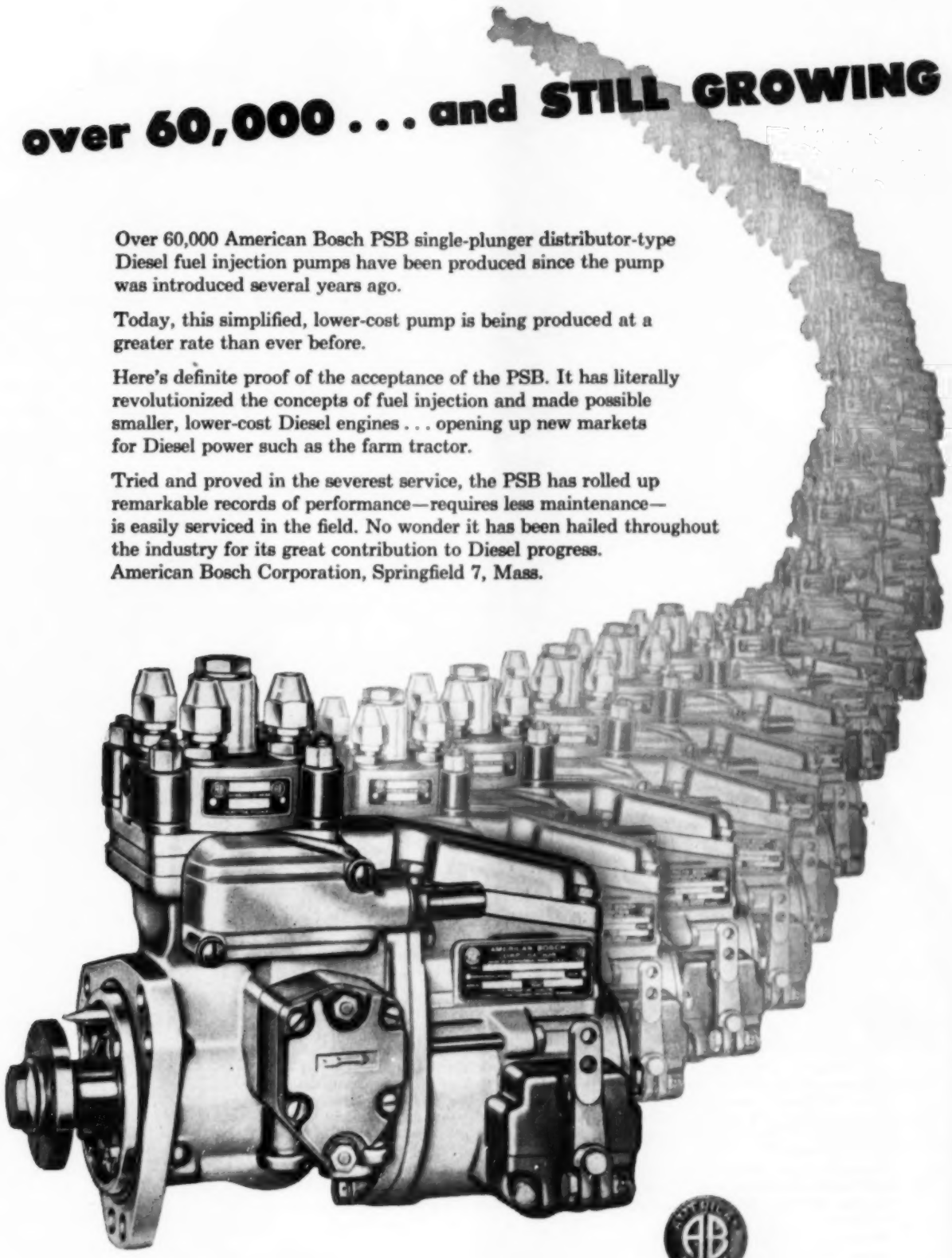
over 60,000 . . . and STILL GROWING

Over 60,000 American Bosch PSB single-plunger distributor-type Diesel fuel injection pumps have been produced since the pump was introduced several years ago.

Today, this simplified, lower-cost pump is being produced at a greater rate than ever before.

Here's definite proof of the acceptance of the PSB. It has literally revolutionized the concepts of fuel injection and made possible smaller, lower-cost Diesel engines . . . opening up new markets for Diesel power such as the farm tractor.

Tried and proved in the severest service, the PSB has rolled up remarkable records of performance—requires less maintenance—is easily serviced in the field. No wonder it has been hailed throughout the industry for its great contribution to Diesel progress.
American Bosch Corporation, Springfield 7, Mass.



2402

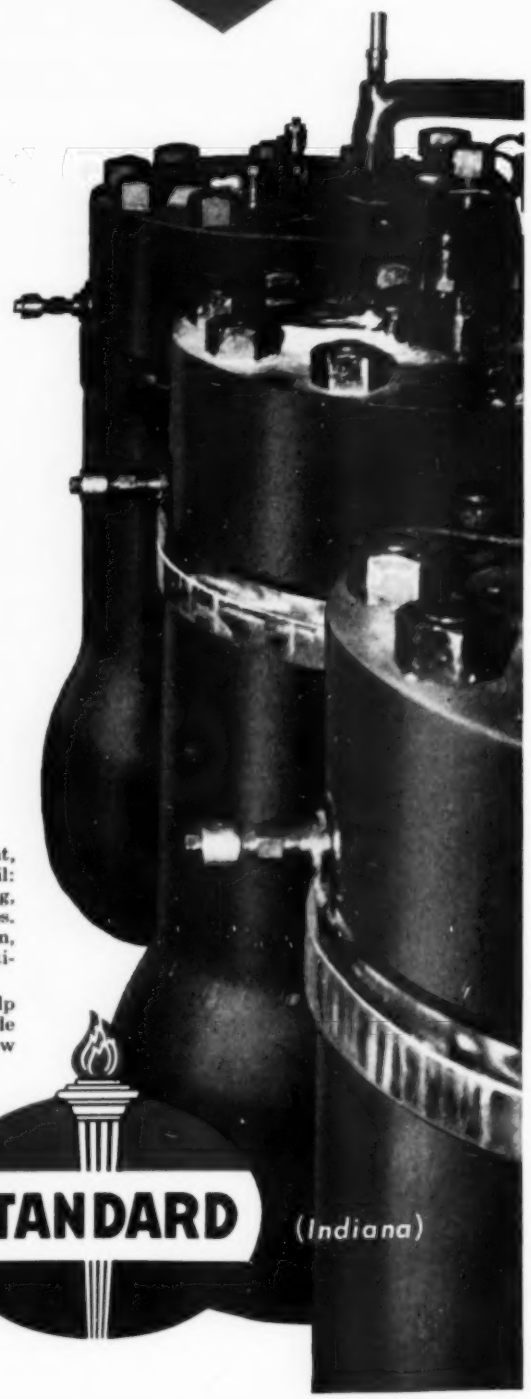
AMERICAN BOSCH

STANDARD HD
TRADE MARK
OIL

keeps rings FREE

(and cuts down wear!)

Bancroft Superintendent, Verne Austin (left) consults with Standard Oil lubrication specialist R. R. Spargo, (right) on periodic check-up to see that STANDARD HD is still in like-new condition.



Here's what Verne Austin, superintendent of the Municipal Light Plant, Bancroft, Iowa, writes about the effectiveness of STANDARD HD Oil: "Before switching to STANDARD HD Oil, we were troubled with ring-sticking, dirty crankcases, excessive port carbon, frequent cleaning and stack fires. Since switching to STANDARD HD Oil, ring sticking is at an absolute minimum, crankcases are *always* clean, port carbon is almost nil, stack fires are practically eliminated!"

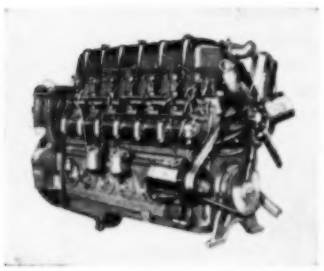
Since this plant switched to STANDARD HD Oil, they have also had the help and advice of an experienced Standard Oil lubrication specialist. He has made regular, periodic calls to check the oil and to make sure it's still in like-new condition.

STANDARD HD Oil lubricates better because it cuts down wear . . . keeps vital parts clean. If you have any lubricating problems, call your nearby Standard Oil office. Or write to Standard Oil Company, 910 S. Michigan, Chicago.

STANDARD OIL COMPANY

STANDARD (Indiana)

7 pounds, 6 oz.–rarin' to go!



Horsepowers, 30 to 255. Two-cycle, 2, 3, 4, 6-cylinder models. Speeds to 1800 rpm. Stationary, mobile, marine. Diesel-generator sets

How much weight to a horsepower? Take one of our P&H Diesels — divide its weight by its power — and that's the figure you get.

The reason we're so proud of our baby: at 7 pounds, 6 ounces this horse is full grown! No competing diesel can produce a full horsepower to that amount of weight. Pound for pound, this engine out-powers them all.

Dollar for dollar, too. A P&H will give you more horsepower per dollar than any other diesel. And just as a sort of extra, it's also the easiest to service!

Not that it will need much servicing. Actually, a P&H Diesel takes less of it than the old gasoline engine. Its fuel cost: *about one-third*.

Some baby!

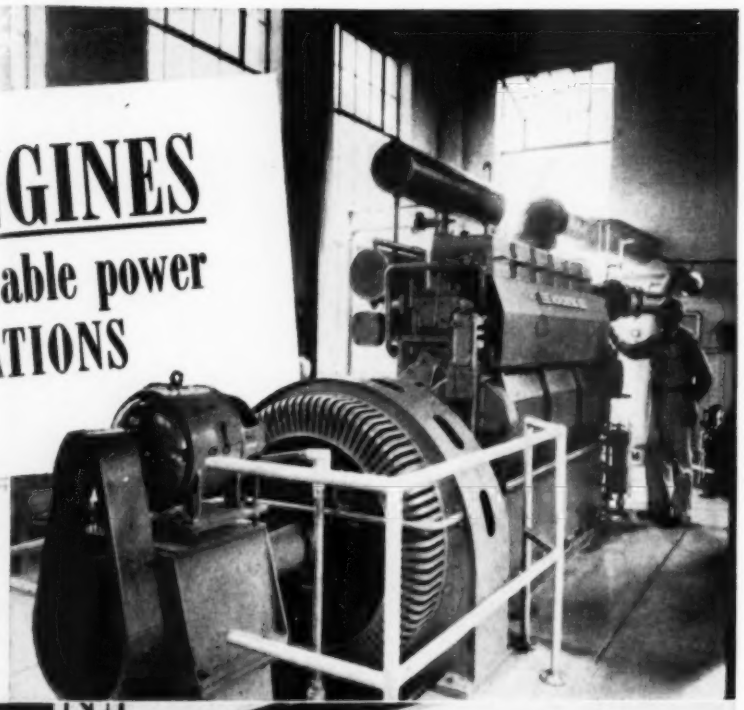
P&H Diesel Engine Division, Harnischfeger Corporation, Crystal Lake, Ill.

THE P&H DIESEL

lowest price per horsepower . . .
lowest weight per horsepower

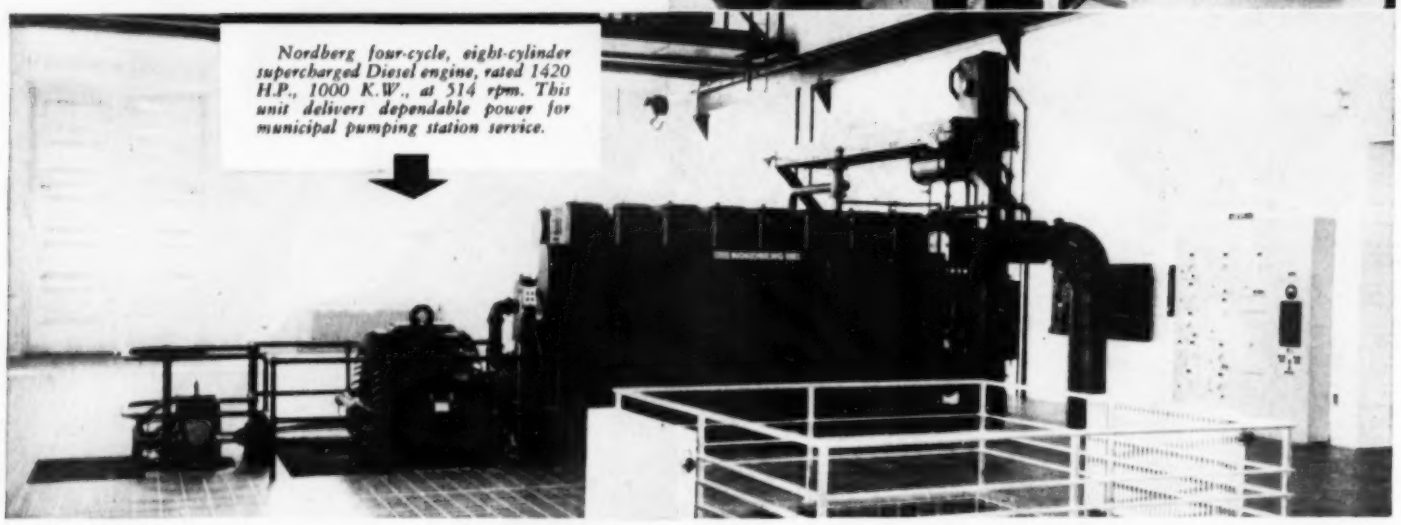
NORDBERG ENGINES

furnish low cost, dependable power for PUMPING STATIONS



Nordberg four-cycle, six-cylinder Duafuel® engine rated 375 H.P., 250 K.W., at 600 rpm. This unit, operating on natural gas, powers two motor-driven centrifugal water pumps.

Nordberg four-cycle, eight-cylinder supercharged Diesel engine, rated 1420 H.P., 1000 K.W., at 514 rpm. This unit delivers dependable power for municipal pumping station service.



WHEN it comes to furnishing reliable, low cost power for municipal and industrial pumping operations, Nordberg engines have been thoroughly job-tested and proved in numerous installations in many parts of the world. Two typical Nordberg Diesel Engine Generator units are shown here, each providing the necessary power to keep electrically-driven water pumps on the job, day-in, day-out.

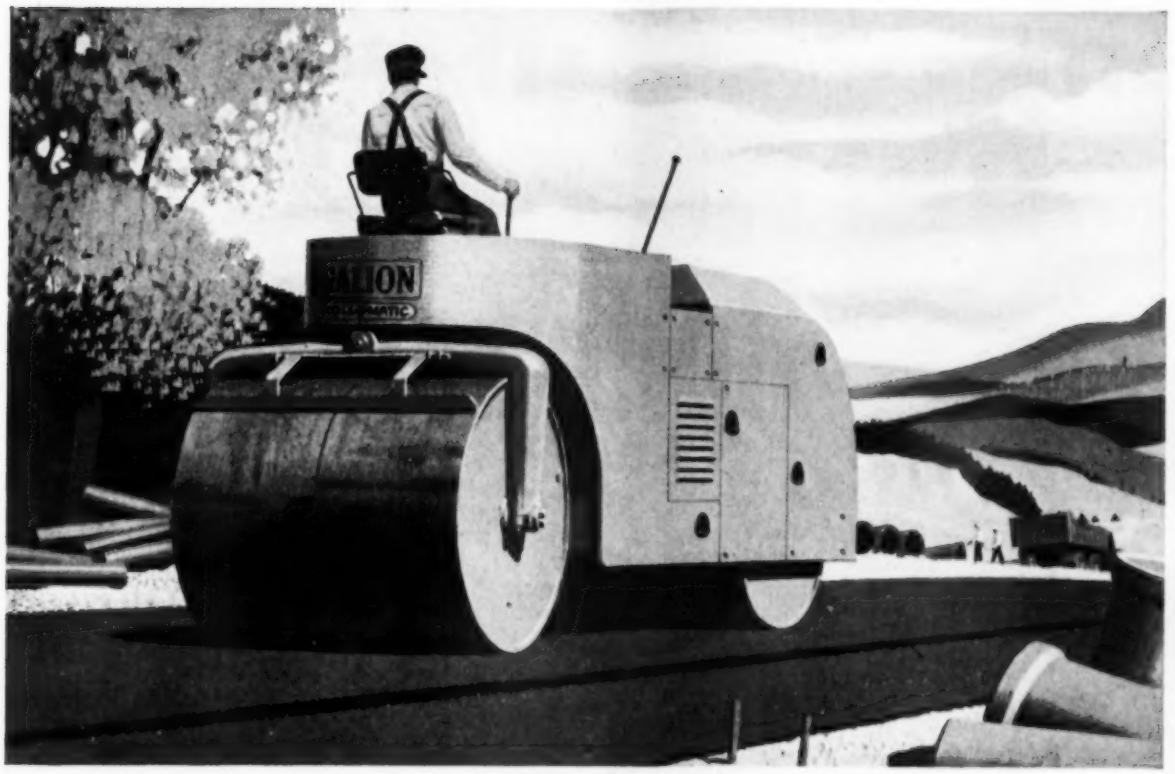
Built to provide the most economical power plant with low first cost as well as low operating costs, Nordberg engines will efficiently burn Diesel fuel, natural gas, or any combination of both—as well as sewage gas, manufactured gas and propane. With this wide fuel selection Nordberg can furnish the most efficient unit to meet specific power requirements . . . for pumping applications and for main or stand-by-power in almost every class of service.

Nordberg, as builders of America's largest line of heavy duty engines, in sizes from 10 to over 10,000 H.P., backed by over a half century of specialized machinery building experience, can give you valuable assistance in solving *your* particular power problem. Call or write for further information. *Nordberg Mfg. Co., Milwaukee, Wis.*

NORDBERG

DIESEL • DUAFUEL® AND SPARK-FIRED GAS ENGINES

P554



NEW GALION ROLL-O-MATIC WITH TORQMATIC CONVERTER

rolls 10% more surface per day

GALION — one of the world's largest manufacturers of road rollers—now offers four new gasoline-powered ROLL-O-MATIC tandem rollers equipped with Allison TORQMATIC Converters.

This efficient combination torque converter and fluid coupling makes ROLL-O-MATIC simpler to operate. It eliminates the master clutch. There are no gears to shift.

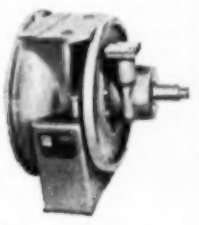
ROLL-O-MATIC rolls smoother in either direction. With the governor directly on the tailshaft it has quicker pickup —takes guesswork out of reversing. Rolling speed is automatically maintained up hill—on the level—down hill and on curves, by means of the combination of the TORQMATIC Converter and tailshaft governor.

The maker reports the operation is so smooth that at least 10% more surface can be rolled per day. And fuel consumption is reduced as much as 25%.

The applications of Allison TORQMATIC Converters are broadening rapidly. With units in a new range from 40 to 150 horsepower to fit both gasoline- or Diesel-powered engines, more than likely you, too, can gain the many moneysaving benefits of this drive. The completely *self-contained* converters are compact, easy to install and surprisingly low in price.

Check your equipment manufacturer or dealer or write us for full particulars.

ALLISON DIVISION OF GENERAL MOTORS
Box 894D, Indianapolis 6, Indiana



GM GENERAL MOTORS

Allison

TORQMATIC DRIVES

"Big Red" TD 24 Rolls for Ryan

SWIFT SELF-LOADING. A pair of hustling TD-24's charge ahead, self-loading 18 yard scrapers as they go. Five of these fast Internationals helped keep the job ahead of schedule.

Contractor completes job 45 days ahead of estimate as TD-24 fleet moves a million yards

Ryan Construction Company, Evansville, Indiana, took on a big job when they contracted to move a million cubic yards of dirt and place 35,000 tons of riprap in site preparation for a new steam generator plant on the Ohio River.

From the first day on the contract, Ryan's five TD-24's made the dirt fly. Their assignment: to cut down two hills and dump the excavated material in old creek bed to make a new power plant site.

They averaged 4 minutes and 40 seconds on the 2,000 foot round trip between cut and fill. Self-loading heaped scrapers, the Big Red fleet moved tremendous yardages every day—kept doing it even in rain and mud, the Ryan people report.

TD-24's are the fastest and most powerful crawlers on the market. That's why "Big Red" performance is paying off not only for Ryan but for contractors across the country who need big crawler power to get tough jobs done on time.

And you can't beat the service provided by your nearby International Industrial Distributor. His trained servicemen, complete stocks of parts and up-to-date shop facilities are available to you anywhere, anytime to keep your equipment in production.

He and the famous line of IH crawlers he sells are willing and able to help you put your contract on a paying basis.

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILL.

INTERNATIONAL INTERNATIONAL HARVESTER **POWER THAT PAYS**

"33,000 HOURS proved the choice was right!"

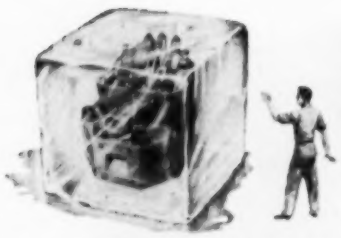
When a prominent North Carolina community converted its power plant to diesel operation, it called in Sinclair Lubrication Engineer Jim Holt for his recommendations on proper lubricants.

Mr. Holt reports, "I recommended Sinclair RUBILENE®. My previous experience convinced me that this diesel lubricating oil would provide maximum wear protection for this power plant's six 1000 K.W. diesel engines. RUBILENE also guards against sticking rings and prevents excessive wear of cylinders, pistons and other moving parts operating continuously for long periods.

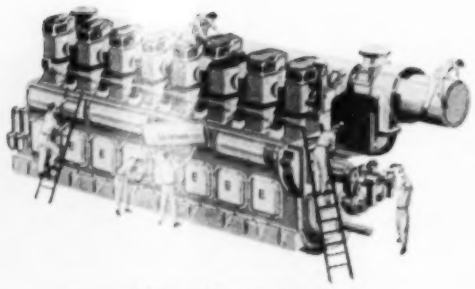
"RUBILENE was the right choice," Mr. Holt continues. "After 33,000 hours of near-continuous operation, bearings show very little discernible wear – and there's not a sign of erosive or corrosive action. *Oil consumption is remarkably low*, considering the prolonged operating hours under overload. All six 1000 K.W. engines, with a total output of 6400 K.W. per hour, *use a total of only 1 barrel of oil a day!*"

Why not give a Sinclair Lubrication Engineer the chance to help solve *your* lubrication problem. *There's no obligation.* Contact your local Sinclair office or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N.Y.

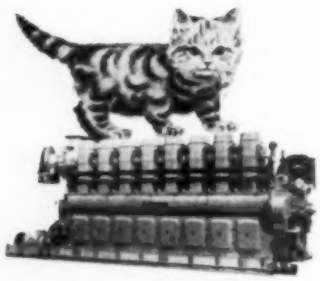
SINCLAIR DIESEL LUBRICANTS



A really efficient cooling system? No "hot spots" with ENTERPRISE –it never runs too hot or too cold!



Accessibility? It's easy to get to *all* the parts!



Low "noise level" and freedom from damaging vibration? ENTERPRISE Diesels are "quiet as a kitten"!

Mr. Diesel Engine Buyer:

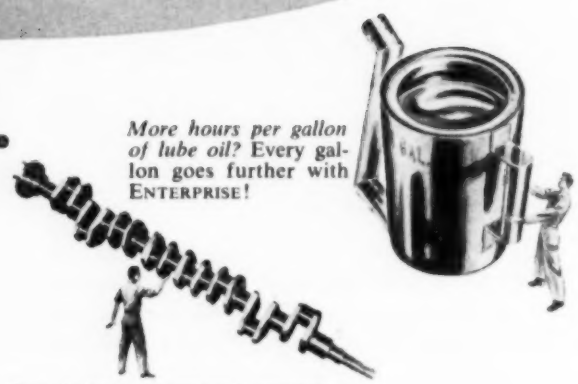
What Do You Look For In A Diesel?

Sustained, continuous and economical performance ...hour after hour, year in and year out!

This is what you want in your next diesel engine. And this is what you will *get* with dependable ENTERPRISE Diesels.

Some of the key features that combine to make ENTERPRISE your best buy in heavy-duty diesels are shown here. There are many others you'll want to know about – up to the minute features of design, materials and construction that are the result of 35 years experience in power research and diesel engine building... features that contribute to the most efficient and reliable power available at a fraction of the cost you'd expect.

Your own comparison will prove that there is no finer diesel. Write for complete information on ENTERPRISE... *the choice of power experts.* Units from 75 to 2700 hp.



More hours per gallon of lube oil? Every gallon goes further with ENTERPRISE!

True balance for smooth running? ENTERPRISE takes the "jitters" out of diesel operation!

Top service... where and when you want it? ENTERPRISE customers get fast service... and parts within hours!

Enterprise
DEPENDABLE
Diesels

18th and Florida Streets
San Francisco 10, California

ENTERPRISE ENGINE & MACHINERY CO.

A Subsidiary of GENERAL METALS Corporation

Boston • Chicago • Denver • Kansas City • Los Angeles
Minneapolis • New Orleans • New York • San Diego
San Francisco • Seattle • St. Louis • Washington, D. C.

DIESEL ENGINES • OIL BURNERS • PROCESS MACHINERY

Motorists: here's proof...

Gulf's cleaner-burning, super-refined gasoline solves today's No. 1 engine problem!

This lamp is burning the "DIRTY-BURNING TAIL-END" of gasoline which GULF refines out
This lamp is burning NEW SUPER-REFINED GULF NO-NOX, the cleaner-burning super-fuel

Laboratory tests promised...

. . . these *immediate* and *lasting* benefits from this new, super-refined fuel:

More complete engine protection than from the so-called "miracle-additive" gasolines. Why? Because Gulf refines *out* the "dirty-burning tail-end" of gasoline (the No. 1 troublemaker in high-compression engines)—and then treats this new Super-Refined NO-NOX to give it a *complete range of protective properties*. It protects *every* part it touches against carbon, rust, gum.

Extra gas mileage in all your everyday, short-trip, stop-and-go driving.

No knock, no pre-ignition. Why? Because the anti-knock power of new Gulf NO-NOX has been stepped up to an all-time high.

Stall-proof smoothness. Instant *starts*, too—and fast, fuel-saving warm-up.

That's why new Super-Refined Gulf NO-NOX gives your engine more power-with-protection than you've ever known.

Road tests proved...

These cars, powered by New Gulf No-Nox, actually performed better than new... after 15,000 miles!

True! After 15,000 miles per car—covering all conditions of city and country driving—Gulf test cars showed these results:

- Higher-than-new horsepower!
- Better-than-new on gasoline mileage!
- And not a single trace of carbon knock or pre-ignition at any time—even on the steepest mountain grades!

COMPLETELY NEW! SUPER-REFINED

New Gulf No-Nox

THE HIGH-EFFICIENCY GASOLINE

for STAMINA and EXTRA EFFICIENCY...

THE *S. S. Cap'n Bill Stump* — a river "workhorse" — is going into a rugged business . . . the sand and gravel trade. The power plant for its propulsion must have the *stamina* to stand up in continuous towing service. And, it must maintain for its owners thrifty consumption in the wide range of engine speeds encountered in that service.

The Brown Boveri exhaust gas Turbo-Charger with which its Atlas Imperial Diesel Engine is equipped, assures greater operating efficiency and economy of this power plant.

Find out how a world-famous Brown Boveri Turbo-Charger improves the overall performance of a diesel engine. Write for information, *today!*

The Kanawha River Sand Company's

S.S. *Cap'n Bill Stump*

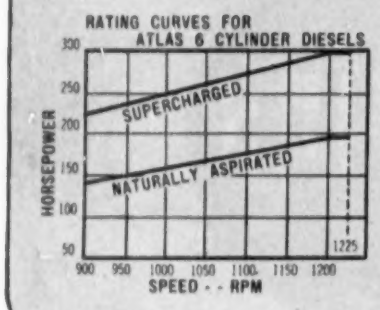
is powered by an

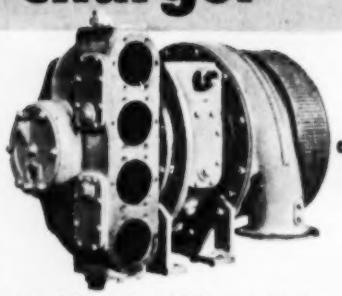
ATLAS Imperial Diesel Engine

equipped with a

BROWN BOVERI exhaust gas Turbo-Charger

This ATLAS IMPERIAL 6 cylinder supercharged Diesel Engine, with Snow-Nabstedt gear and air cylinder for remote control of the gear mechanism, is installed in the recently launched *S. S. Cap'n Bill Stump*. Owned by the Kanawha River Sand Company, it will be used in the sand and gravel trade. This engine is rated 300 hp at 1225 RPM.





A typical Brown Boveri exhaust gas Turbo-Charger such as is used on Atlas Imperial Diesel Engines. These are available in various sizes for charged output from about 100 BHP to 6,000 BHP, 4- or 2-cycle operation.

advantages of:

BROWN BOVERI exhaust gas TURBO-CHARGERS

- **Continuous power increases of 100% or more also available.**
- **No increase in operating costs since chargers run on exhaust gases from turbines.**
- **40% and more reduction in space and weight per HP of supercharged engine.**
- **Self-contained lubricating system eliminates special oil piping outside the engine.**
- **Air pressure equalization prevents pollution of blower wheel and bearings. Ideal for use at high altitudes, too, since pressures can be increased to that of sea level operation.**
- **Only Brown Boveri offers engineering design and application assistance of internationally recognized specialists in turbo-chargers.**

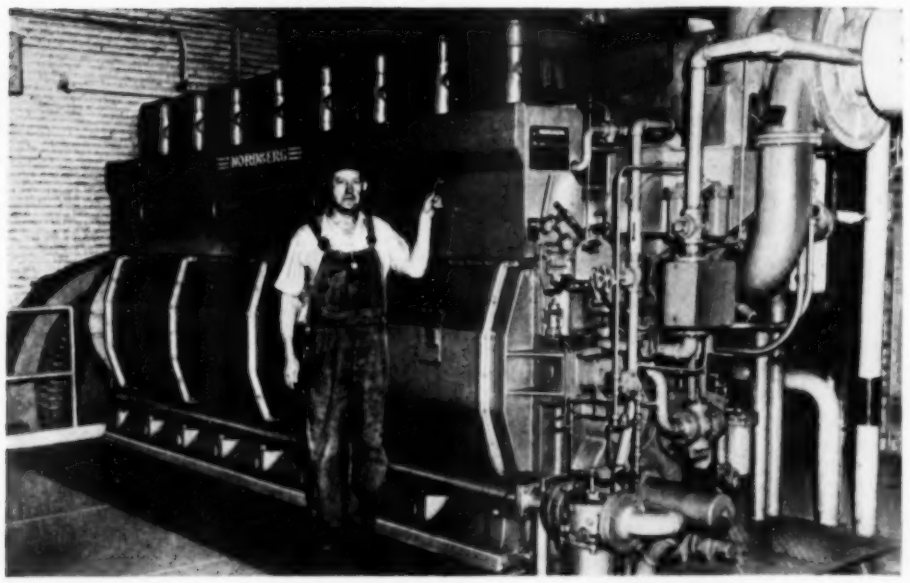
BROWN BOVERI

BROWN BOVERI CORPORATION

19 RECTOR STREET • NEW YORK 6, N. Y.

Atlanta, Ga. • Birmingham, Ala. • Boston, Mass. • Butte, Mont. • Chicago, Ill. • Cleveland, O. • Denver, Colo.
Detroit, Mich. • High Point, N.C. • Jacksonville, Fla. • Kansas City, Mo. • Knoxville, Tenn. • Lewiston, Me. • Los Angeles, Cal.
Minneapolis, Minn. • New Orleans, La. • New York, N. Y. • Portland, Ore. • San Francisco, Cal. • Seattle, Wash. • Tucson, Ariz

This engine maintains a lubricating oil economy of approximately 18,000 H. P. hrs. per gallon



Here's operating efficiency as it has been proved at the Municipal Power Plant, Lindsay, Oklahoma.

A lot of the lubricating oil economy can be credited to the piston rings installed in this Nordberg Duafuel engine. They are Koppers American Hammered Piston Rings. (Porous Chrome*, Tapered O. D., and Grooved Oil Cutter Rings.)

Many manufacturers of diesel and pumping machinery insist on Koppers Rings for their equipment because they know that Koppers Rings make for satisfactory performance.

Test after test also prove that, when Koppers Rings are used for replacements, operating efficiency, and economy are markedly increased . . . often doubled. And Koppers Rings last so much longer that labor costs and costly down-time for repairs are greatly reduced.

So, to save on lubricating oil, to cut down costs, to help save on fuel, remember Koppers. Next time you have an overhaul, think of Koppers first. We are always ready to consult with you on your specific piston ring problems. And for the latest information on Koppers Rings, mail the coupon below.

Koppers Porous Chrome* Rings. Porous chrome surface holds and distributes oil during break-in. Seats quickly. Chrome prevents grit from embedding in ring surface. Prevents cylinder wall scratching. Reduces wear 50%. Lasts 4 times longer than other rings.

Koppers Oil Cutter Rings maintain high unit pressure on the oil film. Seats rapidly. Slots in back of ring permit oil collected in channel on down stroke to flow into interior of piston. Proved efficient in thousands of installations. Extremely popular in vertical compressors and internal combustion engines.

*Van der Horst Process

KOPPERS®

AMERICAN HAMMERED
Industrial Piston Rings

METAL PRODUCTS DIVISION • KOPPERS COMPANY, INC. • Baltimore, Maryland

This Koppers Division also supplies industry with Fast's Couplings, Aeromaster Fans, Koppers Electrostatic Precipitators and Gas Apparatus.

Engineered Products Sold with Service

KOPPERS COMPANY, INC., *Piston Ring Dept.*, [illegible] Hamburg Street, Baltimore 3, Md.

Gentlemen: Please send me free 16-page booklet containing full information on Piston Rings.

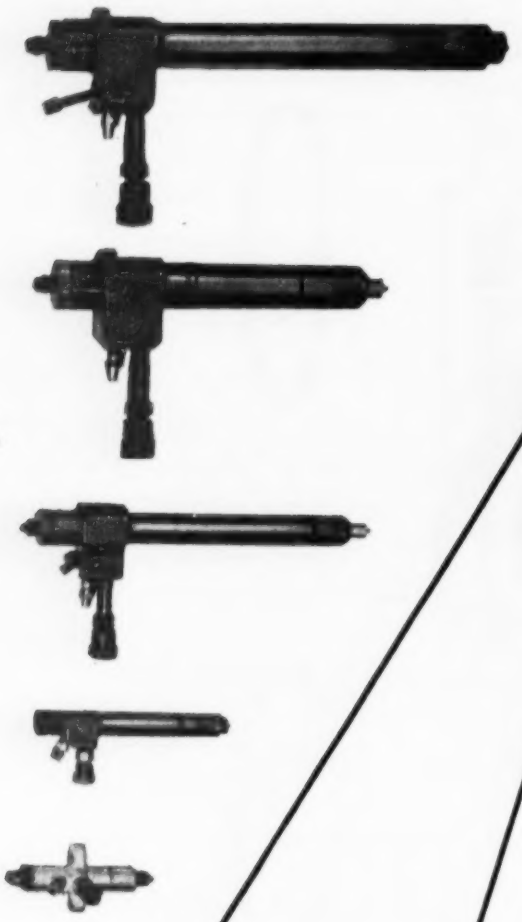
Name .....

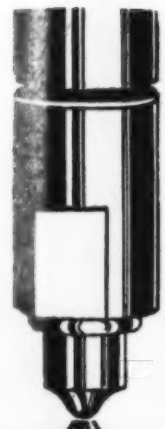
Company .....

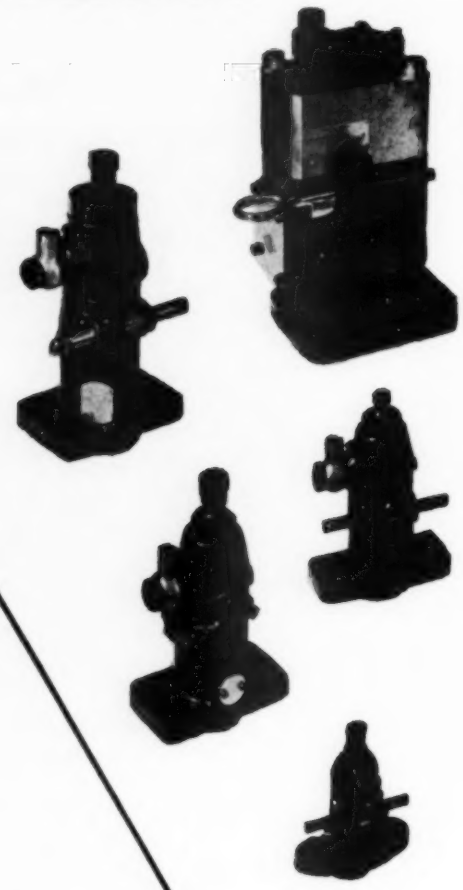
Address .....

City ..... Zone ..... State .....

You Can Depend On *Adeco*







SIMPLE
RELIABLE
EFFICIENT

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FUEL INJECTION EQUIPMENT

NOZZLES, TIPS, AND DUAL-FUEL VALVES OF SPECIAL MATERIAL
FOR ASSISTANCE IN BURNING "HEAVY FUEL"

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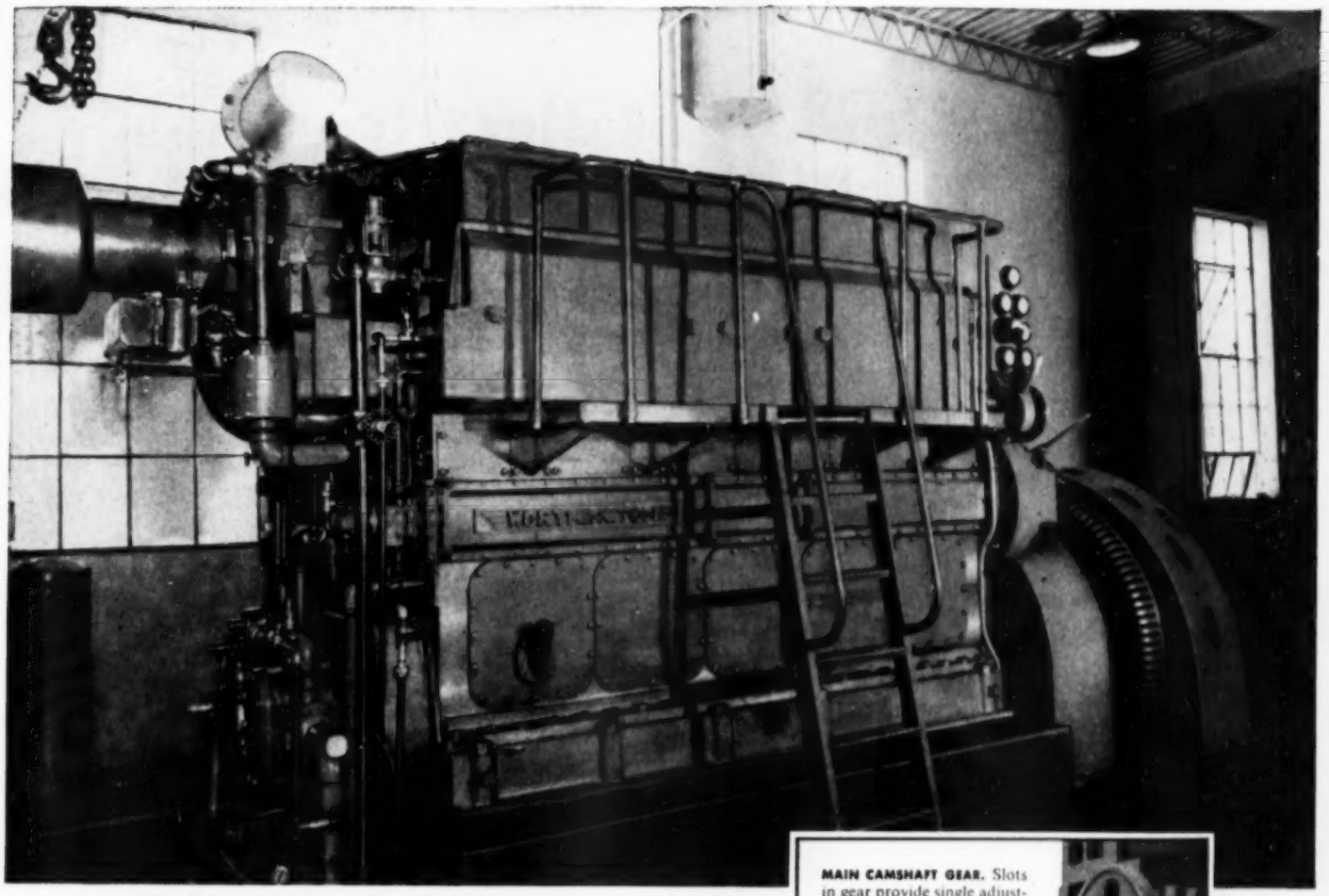


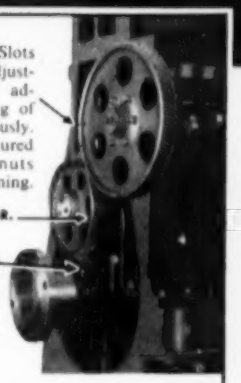
NEW SUPERCHARGED WORTHINGTON TYPE SDR DIESEL ENGINE in the Grand Marais Light and Power Company was specified for its economy of fuel consumption.

Grand Marais, Minn., installs second Worthington Diesel

Six years of efficient performance from their first Worthington Diesel left no doubt as to Grand Marais' choice of a second engine. When demands for power increased, they installed the new Worthington Diesel shown above.

This town, near the Canadian border, has no railroad. Thus maximum engine efficiency was most important in its decision, because of high fuel costs. The new Worthington SDR engine has already effected impressive savings in fuel, lubricating oil and maintenance costs.

Worthington's exclusive features increase your plant's efficiency, lower your operating costs. For more facts on Worthington engines—gas, Diesel or dual fuel—write for Bulletin S-500-B52A to Worthington Corporation, Engine Division, Buffalo, N. Y.



MAIN CAMSHAFT GEAR. Slots in gear provide single adjustment for retarding or advancing injection timing of all cylinders simultaneously. Final gear adjustment secured with castellated locknuts wired after final tightening.

FREE FLOATING IDLER GEAR.

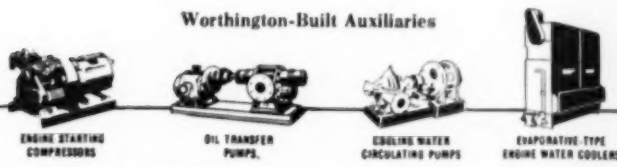
SPLIT GEAR KEYED ON CRANKSHAFT. Permanent adjustment for perfect alignment with idler gear is easily accomplished.

WORTHINGTON HELICAL STEEL GEAR TRAIN
used on Worthington dual fuel engines . . .

1. Provides accurate and positive control of engine timing.
2. Is located at flywheel end of engine for smooth gear operation as power impulses are absorbed by the flywheel.
3. Uses controlled automatic oil jet lubrication that eliminates wear.
4. Assures correct engine timing . . . keeps engine running smoothly . . . results in low fuel consumption and minimum engine maintenance.

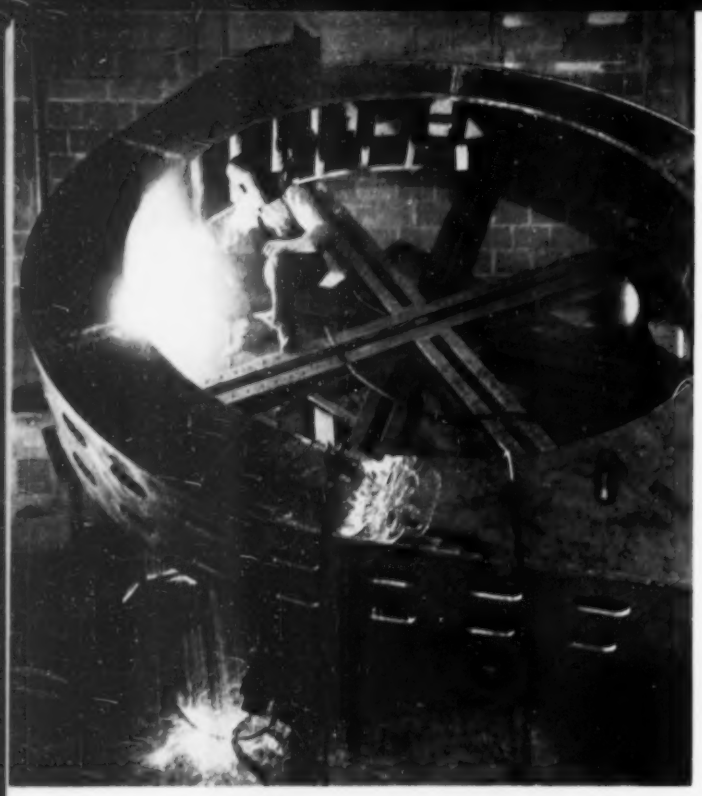
E.3.3

Worthington-Built Auxiliaries



Economical Continuous Power—Diesels, Oil and Dual Fuel, and Spark-Ignition Gas Engines, from 190 to 2,100 bhp.

WORTHINGTON
Engines



To save you time, we've got it in rhyme!

The a b c's of electric generator construction

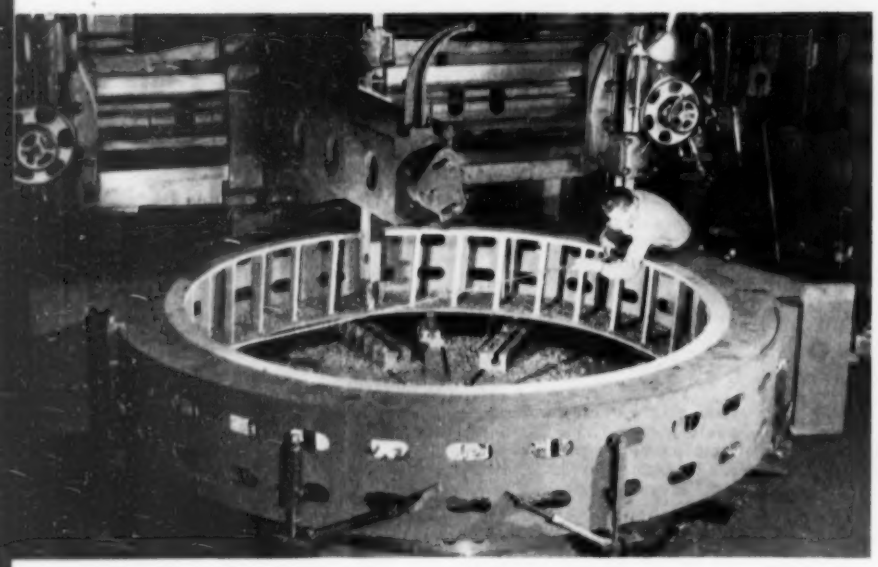
Here's an action picture sequence of a big E-M Custom-Built Synchronous Generator in construction. Step by step, you can observe the meticulous care given to every construction detail by E-M engineers and craftsmen. The little rhymes will call your attention to the key points in each picture.

This particular E-M Generator, built for the Central Kansas Electric Coop., Inc., Great Bend, Kansas, is rated at 4250 kva, 2400/4160 volts, 257 rpm. Your plant's generator requirements may not be this sizeable, but it is a point of pride at E-M that the same careful attention is given to *every* Generator, large or small, which bears the E-M nameplate.

ELECTRIC MACHINERY MFG. COMPANY
MINNEAPOLIS 13, MINNESOTA

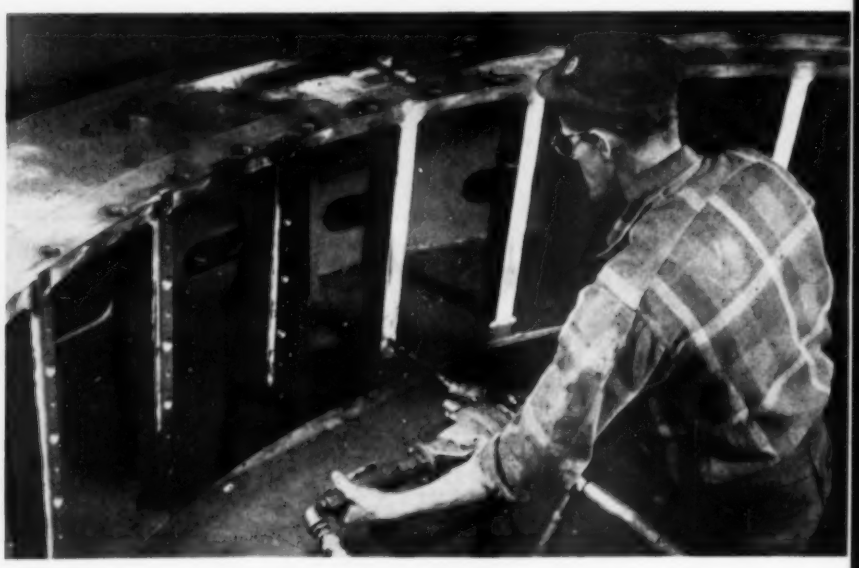
a

A's for All-welded, this frame for long duty,
Unique in its strength, a self-contained beauty.
All welding is done before other work starts,
So it's free from distortion as we add other parts.



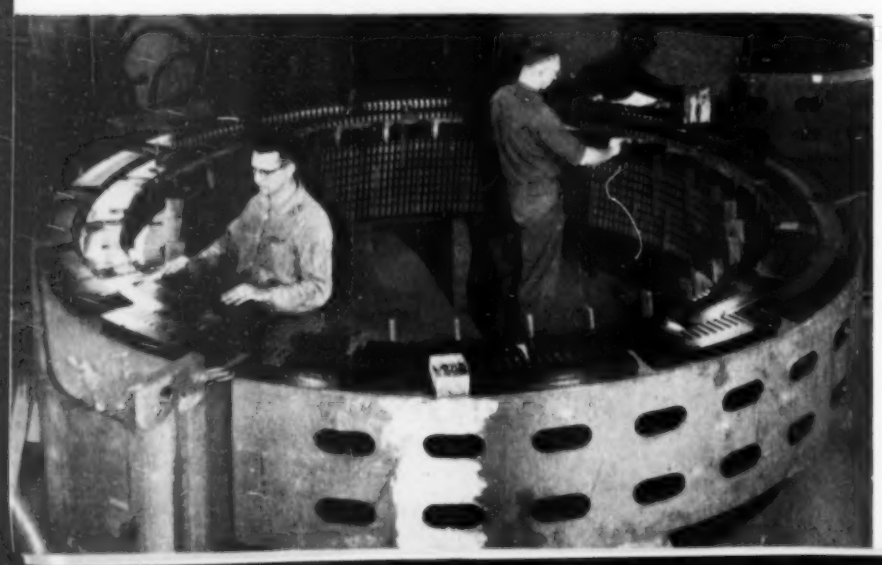
b

Precise Boring is next on this tough stator frame . . .
The air gap stays uniform, always the same.
The resultant gain is a point to remember—
High quality power from Jan. through December.



c

Care in Construction means no through-bolts here;
Unified components are strikingly clear.
And dovetailed keys support each lamination . . .
This is convincing strength demonstration!

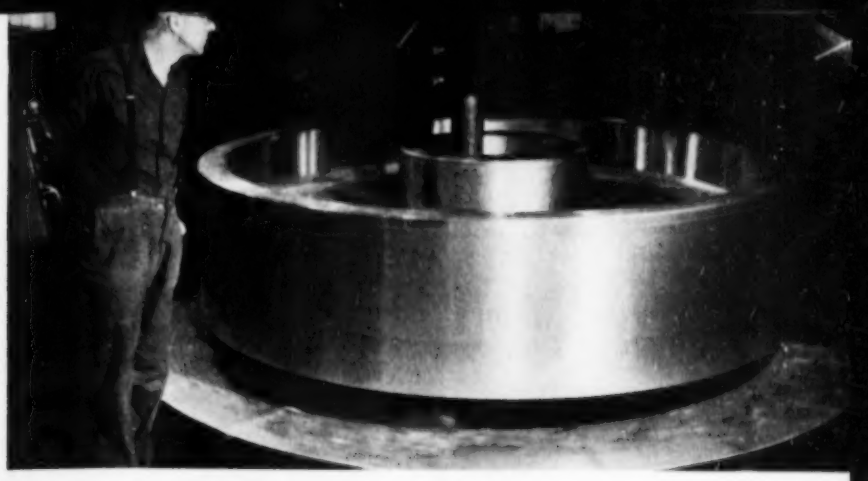


d

Diligence you'll find in the lamination stacking,
Permanently in place . . . what meticulous packing!
Core slots are "skewed" with strict adherence
To lowest possible 'phone interference.

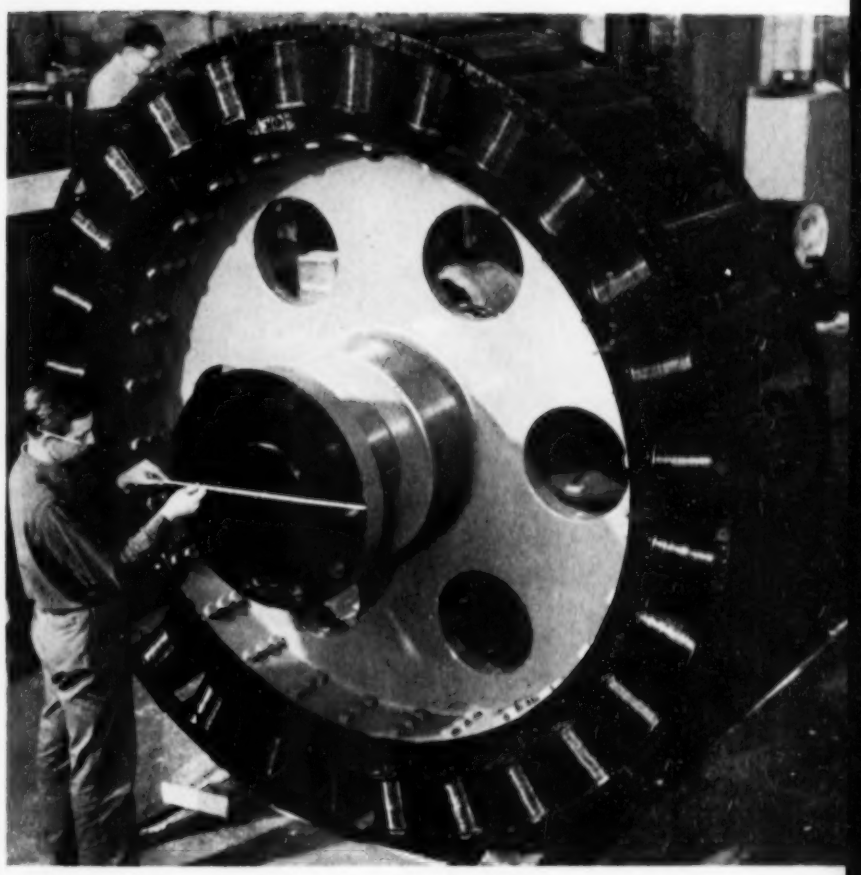
e

The winding Excells, like the lashing of coil ends . . .
No wobbles, no weaving, no movements, no bends.
Special lashing makes coils resist urges
To distort from lightning or switching surges.



f

F is for Flywheel Effect, which increases first-rate
With a cast rotor spider, a true heavy-weight.
And . . . so important in each power station . . .
You get much better parallel operation.

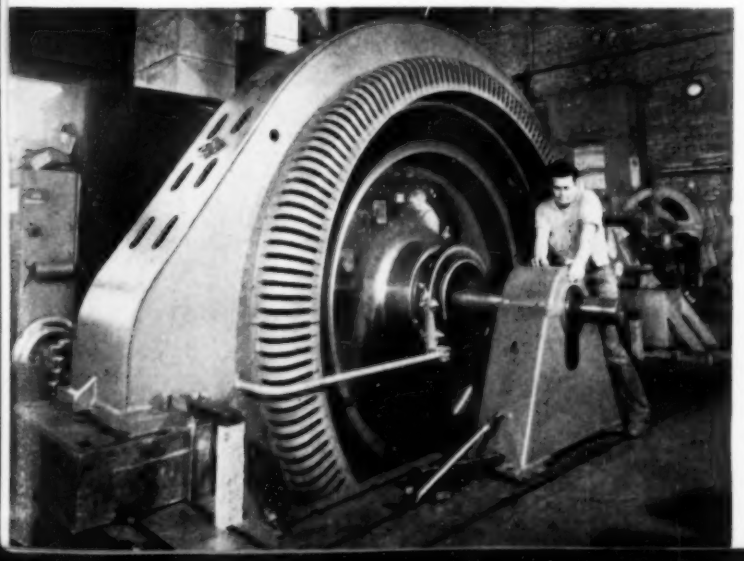


g

Generatorly speaking, even after crystal-gazing
We decided we feature the best method of brazing.
It means better damping, and it's no small sensation
To notice improvement in generator operation.

h

H is for Handsome . . . the rotor complete.
It's a clean, shining beauty that just can't be beat!
Every part is just right . . . every part will stay tight;
Good news for the user . . . good power . . . good light!



i

Inspection is thorough, when we've done all the rest,
For each E-M machine stands a rigorous test.
When it's installed in your plant, you're assured it can take it . . .
It's bound to be rugged, for it had experts to make it!

We suggest, with full confidence, that you contact your nearest E-M sales engineer when plant modernization or new plant planning comes up. He knows electric power generating equipment from A to Z, and can help you materially in getting dependability and extra value in equipment.

Also—be sure to write the E-M factory for your free copy of Publication No. 196, "Your E-M Guide to Profitable Installations of Modern Generators." Electric Machinery Mfg. Company, Minneapolis 13, Minnesota.

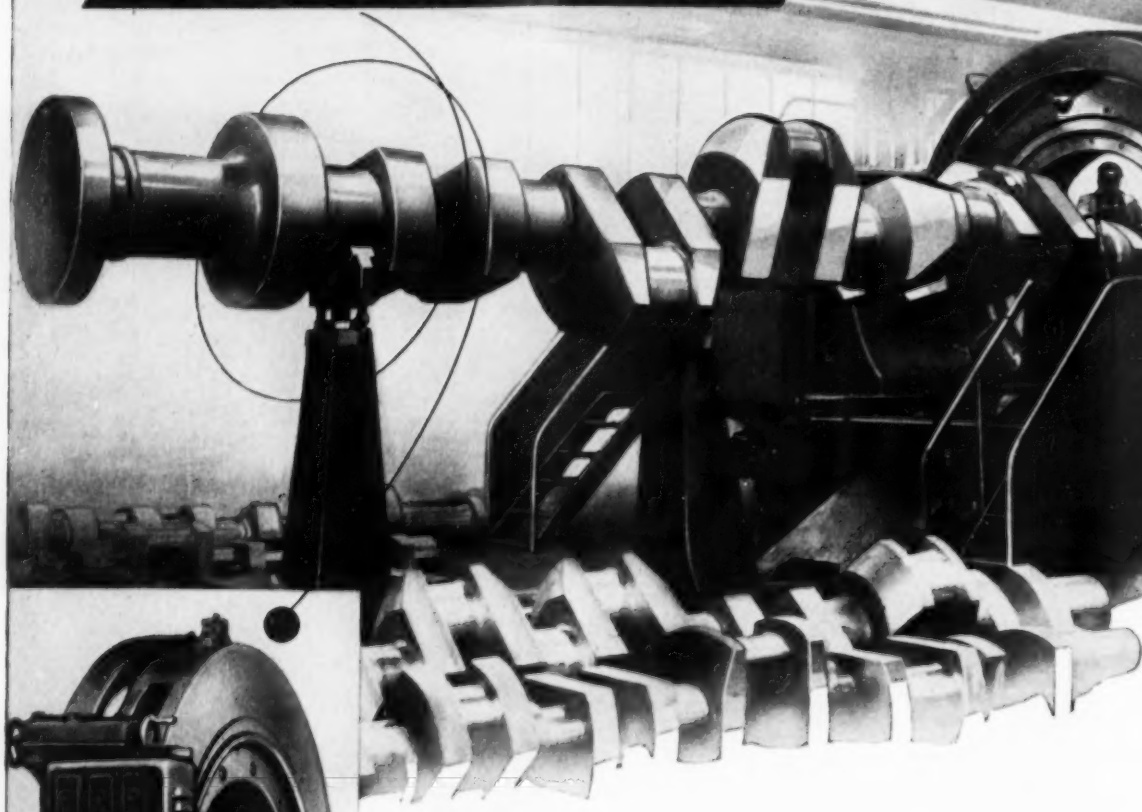
E-M

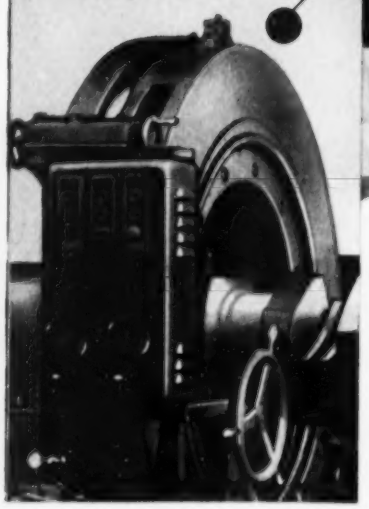
2200 YPA-2139

SPECIALISTS IN *Custom-Built* GENERATORS

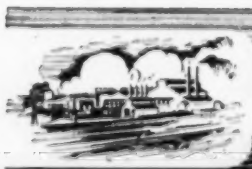
A PIN TURNING MACHINE that revolves AROUND the WORK?

This one does at ERIE FORGE— to achieve MAXIMUM accuracy!

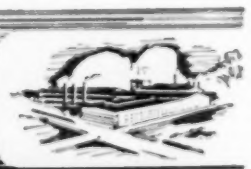




AT ERIE FORGE & STEEL CORPORATION you'll find the most accurate pin turning machine in the country. The crankshaft is held motionless . . . the machine revolves around the work! The crankshaft is accurately aligned, then bolted down . . . it cannot move off center! As this 50,000 pound crankshaft is automatically moved, from throw to throw, through the machine opening, it is finish turned to close tolerances and a mirror finish. This exceptional degree of accuracy is standard practice at Erie Forge & Steel Corporation. Every operation—from ingot to finished crankshaft—is under one control, one responsibility. Consult with us on your next requirements involving crankshafts, connecting rods or allied items.

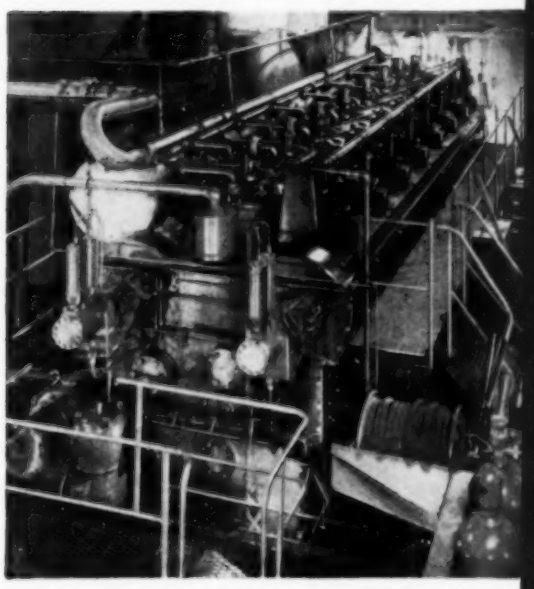


ERIE FORGE & STEEL CORPORATION
ERIE, PENNSYLVANIA



Here's how you can cut diesel engine fuel costs 35.3%

This big (21½ x 27½), slow speed (240 to 257 rpm) Hamilton diesel is saving marine and stationary users 35.3% on fuel costs, because . . .



ANALYSIS (by E. W. Saybolt & Co.)
of 1 gallon sample of #6 fuel oil burned in this ore carrier's Hamilton engine:

Specific Gravity @ 60° F	0.9705
Gravity, API @ 60° F	14.3
Flash, PM CC	235° F.
Fire, C.O.C.	375° F.
Visc. SU @ 100° F	4965 Sec.
Visc. SF @ 122° F	183 Sec.
Pourpoint, ASTM	50° F.
Saybolt Univ. @ 210° F	169
Sulfur, ASTM	0.80%
B.S. & W.	0.3%
B.T.U. Per Pound HV	18,516
Hydrogen	11.46%
B.T.U. Per Pound LHV	17,443
Oxygen (By difference)	0.90%
Specific Gravity @ 160° F	0.9358

It is able to burn unblended heavy residuals. Above is a recent analysis of typical #6 fuel oil used successfully by a Great Lakes ore carrier.

An exhaust as clean as this (above) proves the Hamilton's spherical combustion chamber and exclusive rotary valve promote thorough combustion of such low cost heavy fuels.

"Each year, because of interest in this ship, we have had engineers present at its annual overhaul to check on results secured from use of our products.

"It was felt by all this year that the engine was just about the cleanest engine we have ever observed in many years of marine service. Especially so, considering the use of the varying types of heavy bunker fuel oil.

"The complete absence of varnish or other deposits, in the cylinder liners and pistons; the absence of stuck rings; and the minimum of deposits in the liner ports was remarkable. It would appear that liner wear and piston ring wear have become stabilized at a normal, or possibly even subnormal, rate."

Further proof of the efficiency of this diesel is the above statement by a representative of the oil company supplying the lubricants for this ore carrier.

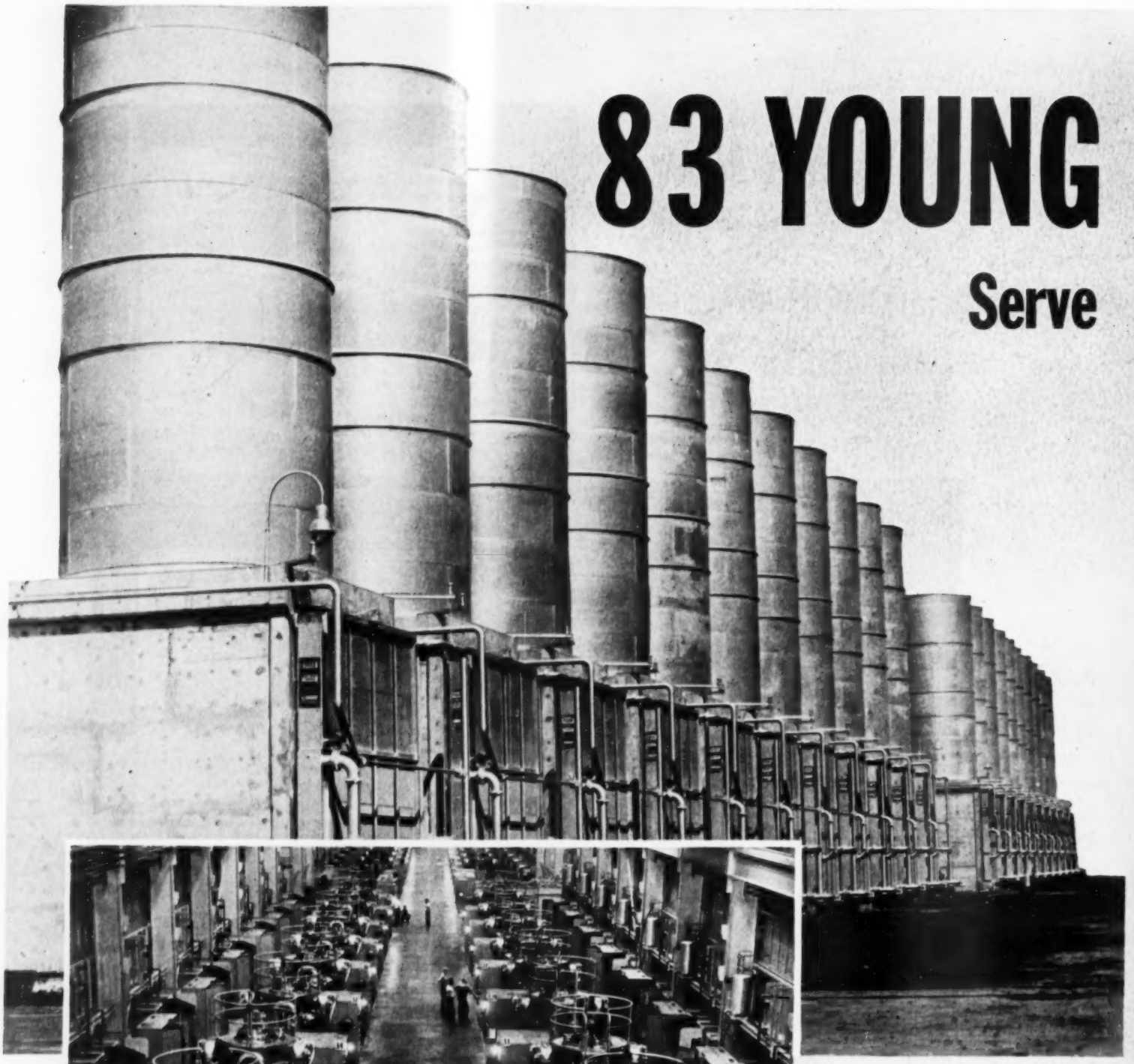
These facts add up to this . . . for stationary or marine service, HAMILTON DIESELS are by far the soundest investment you can make!

Hamilton Division, Hamilton, Ohio

BALDWIN-LIMA-HAMILTON

83 YOUNG

Serve



▲ Bank of 20 YOUNG units used to cool Cleveland Diesel Gas Engines.

◀ Interior view of Power Plant showing Cleveland Diesel Radial Type Gas Engines cooled by YOUNG units. YOUNG units are used to cool all engines in this huge plant.

YOUNG

YOUNG RADIATOR COMPANY, RACINE, WIS.

Plants at Racine, Wisconsin and Mattoon, Illinois

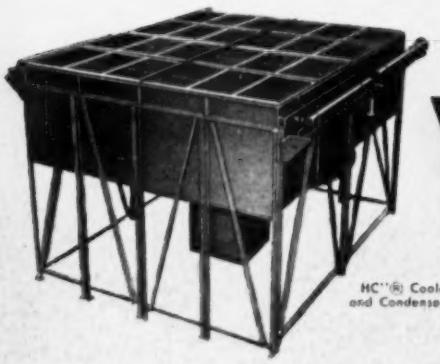
Jacket Water Coolers

Reynolds Metals Alumina Reduction Plant

At the huge Reynolds Metals Corporation, Alumina Reduction Plant in Corpus Christi, Texas, one of the world's largest internal combustion power plants, YOUNG "VAD" and "HC" coolers cool lube oil and engine jacket water on 83 natural gas engines—41 Cleveland Diesel Gas Engines and 42 Cooper-Bessemer Gas Engines.

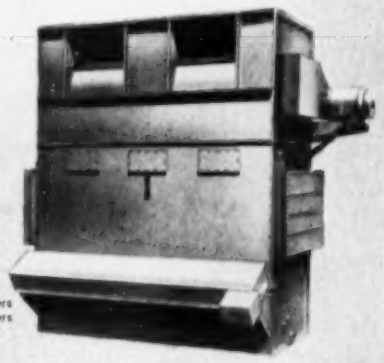
Used to provide electrical power for the reduction of alumina to aluminum, the operating efficiency of these engines is essential. Even the slightest failure in the power generating equipment could cause serious damage to aluminum pot lines. YOUNG "VAD" and "HC" coolers were specified to cool these engines because of their outstanding efficiency even under adverse operating conditions. They are built of the finest materials, and exclusive YOUNG patented features insure minimum maintenance and maximum service longevity. YOUNG Supercharger Air Intercoolers are also used on some engines where increased horsepower ratings are necessary.

When you have a heating or cooling problem, rely on the more than 27 years of YOUNG experience in the design, engineering, and manufacturing of heat transfer products for every industry. The broad line of YOUNG products provides a single source responsibility which assures the compatible operation of every heating and cooling component. And the broad facilities for rapid fabrication assure prompt delivery. Write today for complete information on how Young Heat Transfer Products can solve your heating and cooling problems.



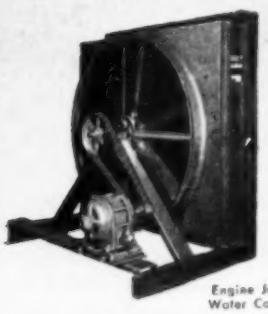
HC"® Coolers and Condensers

Shell and Tube Heat Exchangers



Evaporative Coolers and Condensers

YOUNG | Diesel Engine Cooling Products



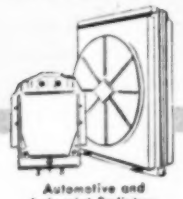
Engine Jacket Water Coolers

Air Intercoolers and Aftercoolers

Mobile and Stationary Torque Converter Coolers

"CC" Combination Cooling Units

Shell and Tube Heat Exchangers



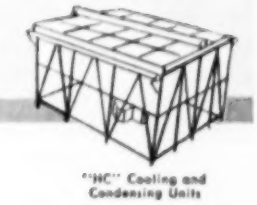
Automotive and Industrial Radiators

Unit Heaters

Convector Radiators

"YAC" Air Conditioners

Heating and Cooling Coils



"HC" Cooling and Condensing Units

The GM Portion of the Power Plant for the Aluminum Smelter at Corpus Christi for

REYNOLDS ALUMINUM

A Detailed Description of the 41 GM Spark Ignition, Natural Gas Engines Installed and Operating Here

By REX W. WADMAN

CORPUS CHRISTI, TEXAS, Sept. 10, 1954—

WHEN I was down here in the early part of 1952 when the San Patricio Aluminum Reduction Plant of the Reynolds Metals Company was just beginning to take final form, I was only able to describe a portion of the power plant because the construction work had not been completed on the remainder. The July, 1952 issue of DIESEL PROGRESS carried a very comprehensive and detailed report on this plant in its overall conception. In detail, I described and illustrated the Cooper-Bessemer side of this huge power plant. In that July, 1952 issue I promised you, our readers, that I would come back here and describe the General Motors portion of the Reynolds Power Plant and that's what I'm down here for today and will be for the next three or four days.

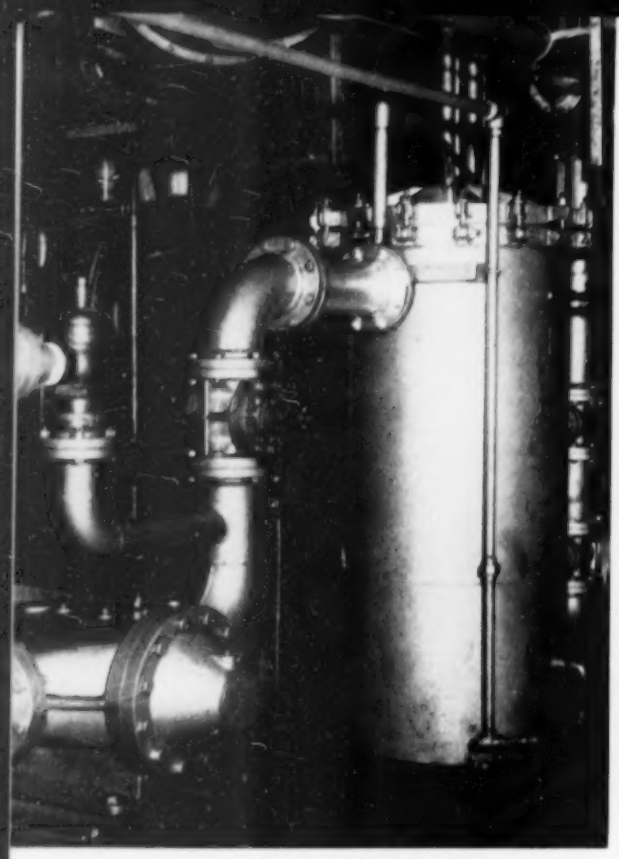
To refresh your memory, the power units installed here at San Patricio, which is across the bay from Corpus Christi, consist of 42 Cooper-Bessemer 16-cylinder, 4-cycle, turbo-charged natural gas engines rated at 2500 kw., 327 rpm., with a bore 15½ in. and a stroke 22 in. Nine of them are used for production of alternating current and are located in Building 40; 33 of these Cooper-Bessemer units are installed in Building 41, supplying power for the adjoining aluminum pot line No. 1. Then in Building 42 are 41 General Motors 16-cylinder, 2-cycle, vertical natural gas engines, 12½ by 14½, rated 2000 kw., 575 rpm. These engines have been supplying the necessary power for Reynolds pot line No. 2 for 21 months. That is the building, and these are the engines that I'm going to talk about in this section of DIESEL PROGRESS for October, 1954. I will mention briefly any changes in the original layout that I find here, but in the main, most of my readers will still remember the description I ran two years ago so I'm not going to bore you with a repetition, other than to simply advise you of any slight changes which may have occurred in either equipment or operational plans.

In addition to the requirements of generating plants for aluminum reduction pot lines, it is to be expected that the great size and new features of a plant such as this will involve special design considerations. Among these special requirements are: *Dependability.* It is essential in the generation of power for aluminum pot line use that utmost dependability be provided. Only a short time is allowable without provision of power, once the pot line is energized. If an overlong power outage occurs, the aluminum metal solidifies in the pots, which then must be re-lined. The repairs to the pots are extremely expensive and time consuming. With this thought in mind, each unit in the ac. and dc. generating plants has been made self-supporting just as far as is practicable. Dependence upon common plant facilities has been kept to a bare minimum, by installing standby mechanical and electrical

View from the crane of the General Motors section of the Reynolds Metals Power Plant, Corpus Christi, Texas, showing 38 of the 41 spark ignition natural gas engines, model 16-358 Cleveland Diesel Engine Division, General Motors Corporation.

equipment. As a result, only failure of gas supply can cause complete plant shut-down. To insure against this there are two pipe lines running into the plant, either of which can operate the entire plant. *Low Labor Cost.* Care has been exercised in design, selection and layout of equipment, and provision of automatic devices insofar as practicable, to avoid the requirement of a large amount of operating labor, which might otherwise be required with such a large number of units. Full safeguards have been provided to prevent starting the units unless conditions are proper, and which will shut down the units in the event of improper or unsafe operating conditions. *Low Installation Cost.* The design of the foundations and the buildings has been coordinated with the type of engines selected. *Climate.* The high atmospheric humidity encountered at the plant site has made necessary provisions of totally enclosed motors with Gulf Coast insulating dip and special vent provisions, space heating in generator switchgear, and control cubicles, and special painting of metal surfaces. The rather dusty air conditions encountered have required provisions for filtering the engine intake air, and the high ambient air temperature requires forced ventilation of the buildings. *Wind.* The past occurrence of extremely high winds has resulted in a design of the buildings and all outdoor equipment to withstand a wind velocity of 125 mph.

With all of these conditions in mind the selection by the Reynolds Metals Company of spark igni-



One of the 41 Hilco full-flow lubricating oil filters. In upper left, one of the Zallea exhaust expansion joints.

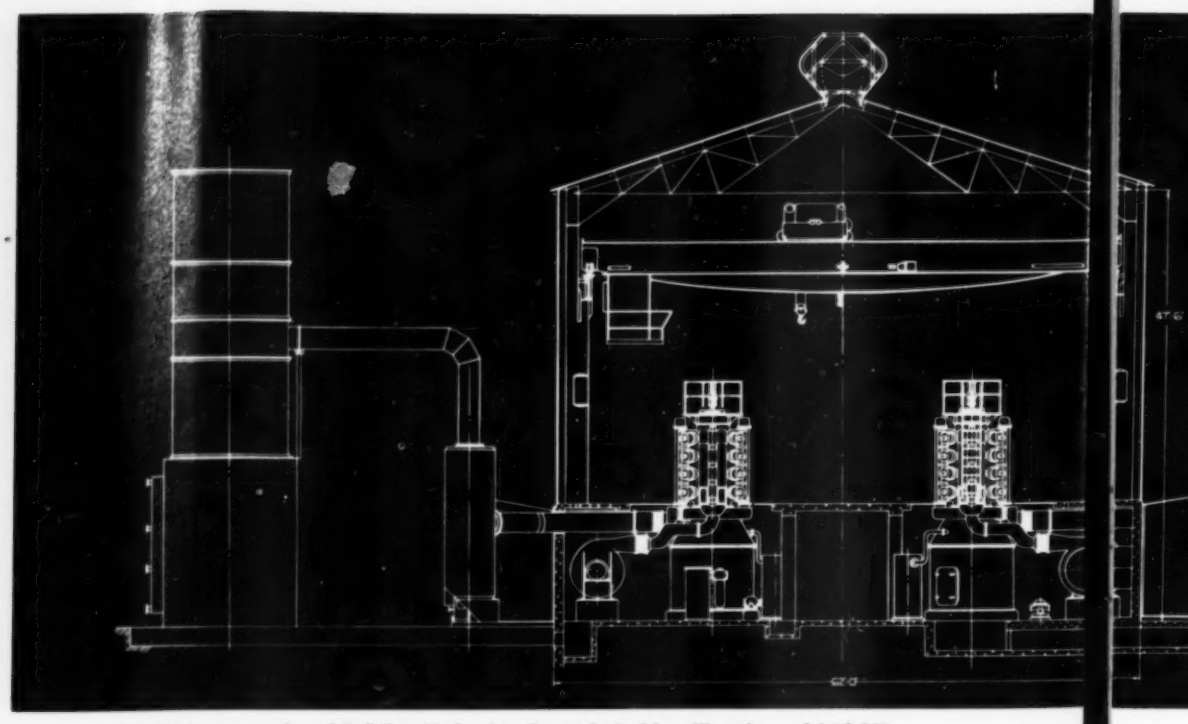
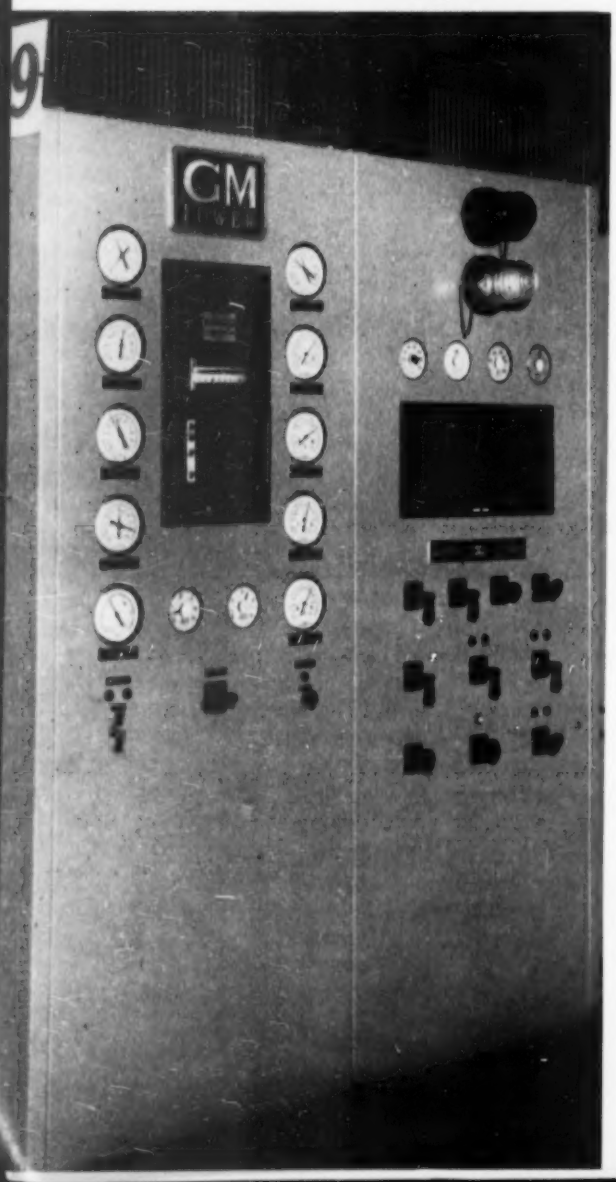


Fig. 2. A cross-section of Building 42 showing the method of installing the model 16-338 General Motors units in vertical banks with the generators underneath the main floor. All auxiliary machinery and equipment is located on the generator level as indicated. To the right you have the American automatic air filters, behind them the Maxim Silencers and to extreme right the Young Radiators which cool both the lube oil and engine jacket water.

Fig. 1 The control cubicle which contains all of the necessary master controls for each of the 41 General Motors engines in this Building 42. Note Bristol diesel engine scanning pyrometer.



tion natural gas engines to solve the power problem here has proved to be a very wise one.

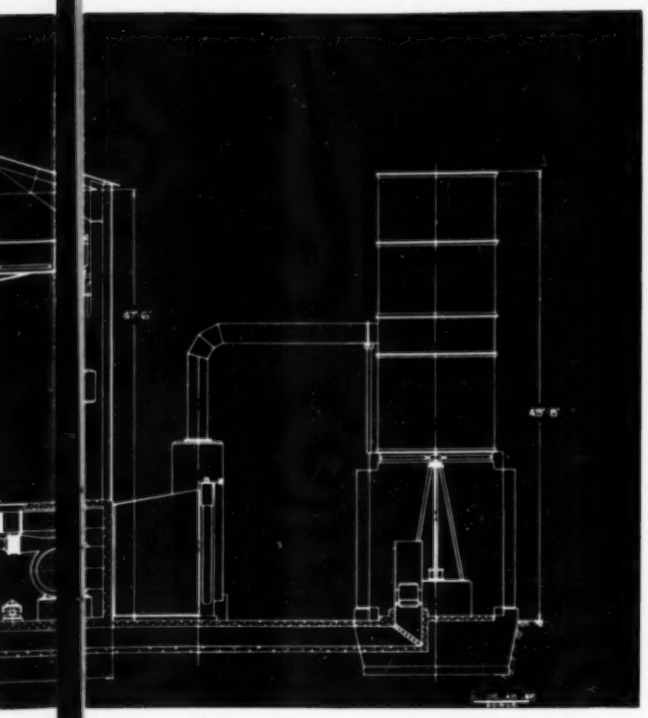
Each of the General Motors engines drives a vertical dc. generator rated 2000 kw. at 725 volts, 40°C. rise, Class B insulated. This generator has the same voltage range of 650 to 800 volts dc. as those for the Cooper-Bessemer units. The entire electrical system for this plant is a virtual duplicate in function of that of the Cooper-Bessemer equipment. The only essential differences are that the General Motors units are electrically started rather than air started, and that the arrangement of sub-stations serving the auxiliaries is somewhat different in details and ratings, principally in the requirements of the scavenging blower motors for each engine in this building. The unit sub-stations serving the auxiliaries consist of eight 1500 kva. units, each having five feeder breakers serving a group of individual engines.

Electric starting of each engine is accomplished by using its generator as a motor for cranking. In addition to the two field busses, there is installed a starting bus to which each generator is connected by means of a starting contactor for the starting operation. The starting bus is in turn supplied from one of the main exciters to provide variable voltage power supply for starting the engines consecutively from a complete plant shut-down. Either exciter may be used as a starting source while the other is used as a main field source for normal operation. In addition, there is furnished a small generator field supply set to provide full field for one generator for starting in case one of the main exciters should be put out of service when starting is required.

The main exciters, the amplidyne exciters, the general service unit sub-station, the storage battery, the battery charging equipment, all are duplicates of that for Building 41, and are located in the central control bay of Building 42. Likewise, there is an engine generator control cubicle and an auxiliary motor control cubicle which performs the same function as described before, and a remote master operator's panel in Building 43 which is essentially a duplicate of the other unit. Other than for the method of starting, the functional control and metering of both dc. power plants are the same. These two power plants are rated as nearly the same as practically possible. The Cooper-Bessemer Building 41 has 33 engines rated at 2500 kw. each, for a total of 82,500 kw. Building 42 contains the 41 GM units rated 2000 kw. each, a total of 82,000 kw.

The Exide 60-cell station control battery for control of the switchgear equipment and its charging equipment are duplicates of those in Buildings 40 and 41. (In other words, the Exide installation includes one 60-cell station battery for each of the three buildings, and 83 12-volt, 6-cell ignition batteries, one for each engine.)

All 16 cylinders of all the 41 GM engines here at Corpus Christi are equipped with a Kiene standard indicator cock which may be noticed on each cylinder head. A member of the operating staff goes around with a Kiene diesel indicator, showing up to 2000 lbs. pressure, a length of flexible hose to which is connected the tapered plug and wing nut connector. The operator swiftly connects the wing nut connector, takes a reading, disconnects the connector and continues that operation for the entire 16 cylinders. Originally, a record was kept every shift of the cylinder pressures on all engines. That has now



been discontinued in favor of keeping a record only of those cylinders whose pressure is substantially lower or higher than average standard.

The 41 General Motors engines use Young VAD-type units. Each unit has four vertically mounted water cooling coils (two on each side) and two vertically mounted oil cooling coils (one on each side). The single-pass water coolers use copper tubes with aluminum fins. The ⅝-in. by .035-in. tubes are rolled into the steel tank. The tanks are of fabricated steel. Core face dimensions are 48 in. by 150 in. Water coil manifolds are 6 in. IPS to connect the coils in series for water flow.

The single-pass low pressure drop oil cooling coils are of ¾-in. by .049 in. tubes, ferruled and rolled to the tank. Fins and tubes are die formed and are the turbulating agitator type made of aluminum. Easy maintenance is insured because the ferrules are large enough inside to permit withdrawal of the agitators. Finned face dimensions are 69 in. by 150 in. The fan shroud rests on the concrete end walls, and the coils and stack are supported by the walls. The tripod and fan assembly is based entirely on independent foundations clear of the main frame and coil structure, so that no vibration is transmitted from moving parts to the coils. Welded steel tripod, fan shaft and gear box were assembled and aligned at the factory to reduce assembly cost at the site and assure perfect alignment. Spiral bevel gears with extra heavy bearings are used. These are assembled, run in for check, torn down and reassembled for accuracy and sureness of continued operation. The entire weight and thrust of the fan is carried on the combined thrust and radial type bearing at the top of the tripod and none on the gear box bearings. Flexible couplings in the fan shaft and in the power input shaft to the gear box insure no strain on those parts.

Each General Motors engine has its own self-

A view of one of the 16-cylinder spark ignition natural gas engines at Corpus Christi as supplied by the Cleveland Diesel Engine Division of the General Motors Corporation. Note simplicity of fuel injection, Scintilla coils, Champion spark plugs, and Scintilla timers.

The lubricating oil treatment room off in a building by itself, containing three sets of United States Hoffman Machinery Corporation's lubricating oil treating units. The two at the right, just installed, haven't even been painted yet. All lubricating oil from all power buildings is handled in this room. Of course the oil from the Cooper-Bessemer units is treated separately from the oil from the General Motors building because different types of lube oils are used—Phillips for Cooper-Bessemer and Magnolia for General Motors.

Twenty-one of the Young Radiator Company's combined cooling units for cooling both lube oil and jacket water for the GM engines installed in Building 42. You will notice that the Reynolds Metals Company's trademark appears on the water tower at the rear. On the other side of this Building 42 are, of course, located the other 20 Young Radiator units.

contained lubricating oil circulating system, containing some 500 gallons of oil per engine. The separate oil sump tank is located near the engine base from which the motor-driven lube oil pump takes the oil and discharges through the Hilco lube oil filter and then through the Young radiator to the engine. The oil to the engine is controlled by a pressure regulating valve. Oil pressure on the engine header is maintained at 25 to 40 psi. Connections are provided to the engine sump and various points in the engine recirculating system, both for separate motor-driven pump scavenging of the engine system and for refilling the lube oil system of the engine with new or reconditioned lube oil.

The Maxim exhaust silencer was chosen to meet the high quality of silencing of the engine exhaust considered necessary at the San Patricio plant. This plant is located rather near Corpus Christi Bay, with Corpus Christi across the bay and other towns considerably closer. It was felt essential to avoid exhaust sound transmission across the water by installing the high degree exhaust muffling equipment.

The unloading, storage, supply and reconditioning of engine lubricating oil and of air filter oil is in a separate building set aside for the necessary equipment, centrally located in an oil tank farm, beside a railroad spur and a truck roadway.

Separate storage facilities have been provided for lubricating oil for the Cooper-Bessemer and the General Motors units, to allow for use of different types of lubricating oils. New lubricating oil storage consists of one 15,000-gallon storage tank for each type of oil. This arrangement is repeated for clean or reconditioned lubricating oil. There are two 2000-gallon storage tanks for each type of oil as withdrawn for reconditioning.

New lubricating oil, as unloaded from tank car or truck, is metered and put through a strainer and filter before pumping it to storage. Pumping equipment in the oil handling building draws this oil from storage and delivers it through strainers and meters in the individual power generating buildings to individual units. New oil is largely used for makeup. Used lubricating oil is pumped from storage through U. S. Hoffman vaporizer type reconditioning units, then to clean oil storage. This oil is then pumped through strainers and meters in the individual power generating buildings to individual units, as is the new lubricating oil. This reconditioned oil will largely be used for recharging engine systems.

As previously discussed, the lubricating oil scavenging pumps and meters for withdrawing lubricating oil from individual units are located in the power generating buildings. This equipment transfers used lubricating oil to storage in the oil tank farm. Currently Magnolia 40 lube oil is being used in the General Motors engines.

One common air filter oil handling system is provided for the entire plant. Tank truck or car unloading equipment, in the oil building, pumps and meters oil to two 8000-gallon tanks used for both new and reconditioned air filter oil. New and reconditioned air filter oil is drawn from storage by oil building pumps, and delivered to any of the engine air and building ventilating air filters. Dirty air filter oil is withdrawn from the air filter sumps by scavenging pump in the individual power generating buildings, and is pumped to the three 1200-gallon dirty oil storage tanks. These tanks have cone bottoms to permit settling out and draining off as much as possible of the water and dirt in the oil. This reduces maintenance on the air filter oil reconditioning equipment. Air filter oil is withdrawn from the settling storage tanks, and is cleaned in a battery of three Sharples centrifuges, then pumped to new and reconditioned oil storage. The whole system contains some 56,000 gallons of viscosene air filter oil at all times.

Oil handling building motors and centrifuge controls are explosion proof. Storage tanks are surrounded by dikes to retain oil in event of leakage. Metering is provided to determine the amount of lubricating oil unloaded, and that is used by any of the power generating buildings, or by any individual engine-generator unit. The amount of lubricating oil returned for reconditioning is also metered. Air filter oil is metered as unloaded and as reconditioned and stored.

When I described in our July, 1952 issue the units mounted on and within the control cubicles which are located adjacent to each engine, I briefly referred to the scanning pyrometer. But I would like to say a little bit more about it here,

because it offers some unique advantages in connection with control of large units of engines.

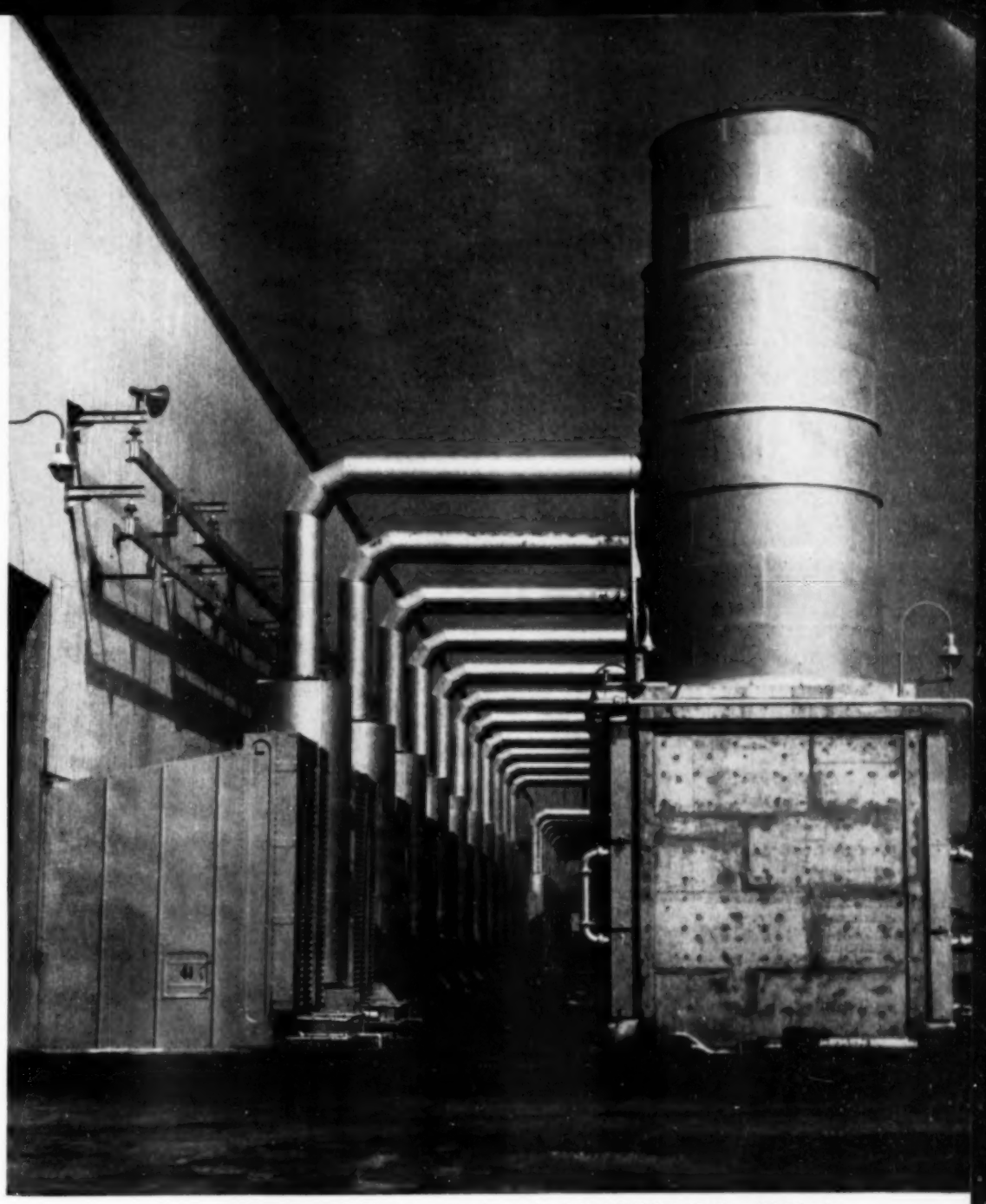
The Bristol Diesel Engine Scanning Pyrometer installed on the control cubicles for the GM engines is designed to measure the temperatures of the engine cylinder exhausts, the generator bearings, and the air adjacent to the generator windings. A motor-driven selector switch scans the sources of heat in a regular sequence, making one complete cycle in two minutes. The instrument actuates an alarm when any one of the measured engine exhaust temperatures exceeds the pre-selected high limit, and also if any of the measured engine exhaust temperatures is less then the pre-selected low limit. Because the pre-selected high limits of the engine exhaust temperatures and the bearing and air temperatures are different, automatic switching circuits are provided to change the range of the millivoltmeter mechanism so that the same high alarm setting can be used for all of the temperature measurements. The Bristol pyrometer continuously and visually reads the exhaust temperatures of all cylinders at a speed low enough for the floor operator to copy on his record sheet at given specified intervals of time the actual exhaust temperature of each cylinder of each engine and the generator bearing temperatures and the generator air circulating temperatures.

Getting back to the handling of the lubricating oil for the moment, the oil is not subjected to any other treatment, other than constant circulation through the Hilco full flow unit, until it is taken out of each engine system and returned to the pump and service room which is a manually controlled system of returning oil to storage.

This is periodically done, based on a report from the testing laboratory here at the plant which runs samples through at regular intervals from each engine, and when the analysis of the oil calls for return to storage then the lube oil scavenging pump is turned on and the oil is taken from the engine lubricating oil sump tank to the dirty tank farm, then through the Hoffman vaporizer and reclaiming unit, of which there are three complete sets, and back to the clean oil tank. The Hoffman units boil off the water and other contaminants, and do a job of reconditioning.

The engine combustion air is taken through American Air Filter multi-duty automatic oil bath type filters, which consist of motor-driven endless panel filter curtains that move periodically through an oil bath which cleans and oils the panels preparing them again for the job of filtering the air. In the lower part of Texas where this plant is located, there is a continuous wind blowing, resulting in a very dusty air condition.

To keep the power house clear of dust, it is necessary to pressurize the building at all times. For this purpose, 52,000 cfm. of filtered air is taken into the building per engine. Of this amount, the generator cooling air fan uses 15,500 cfm. for cooling the generator. This air is taken from the building, through the generator and discharged through the hole in the engine generator foundation and out into the radiator cubicle.

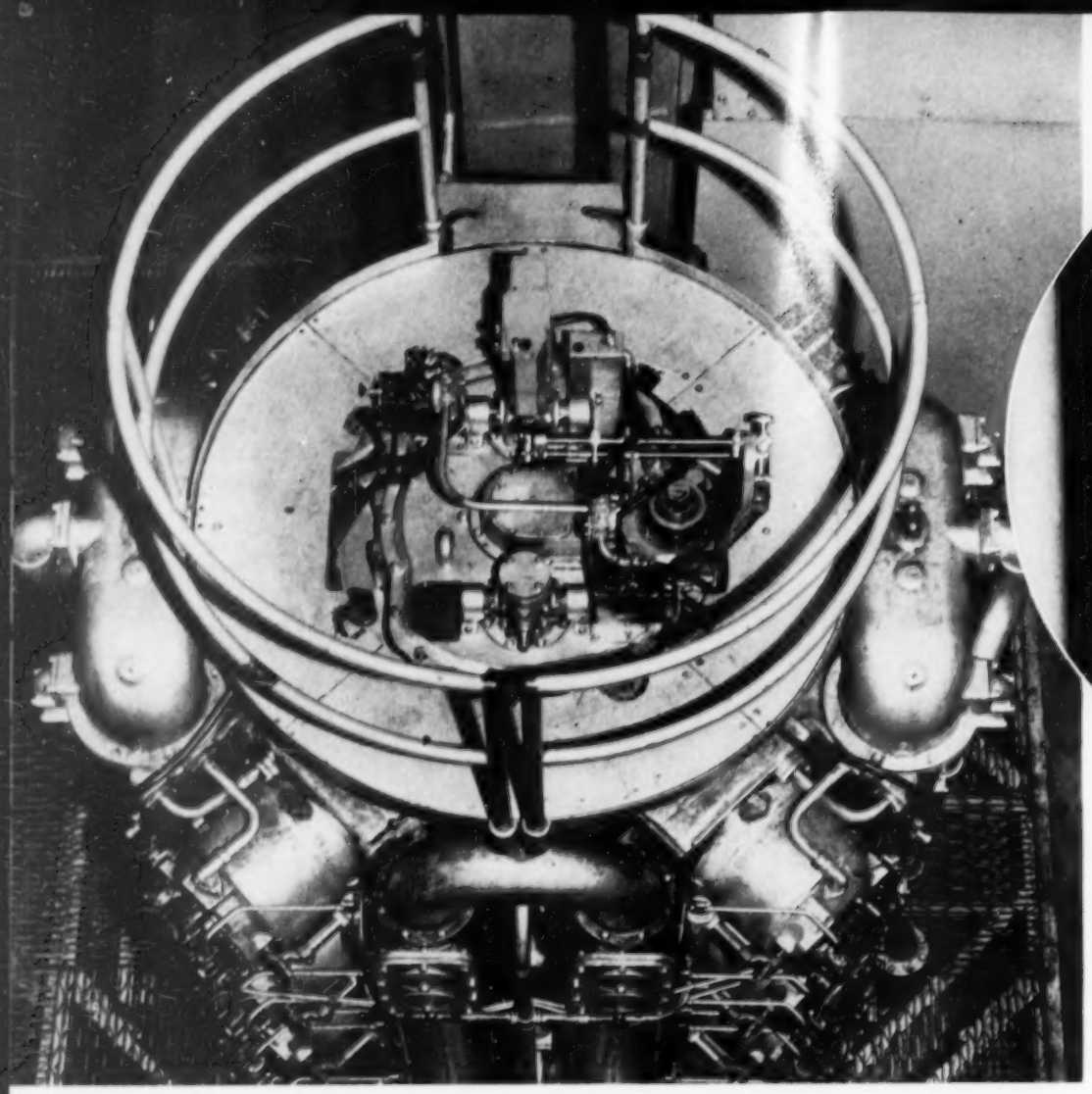


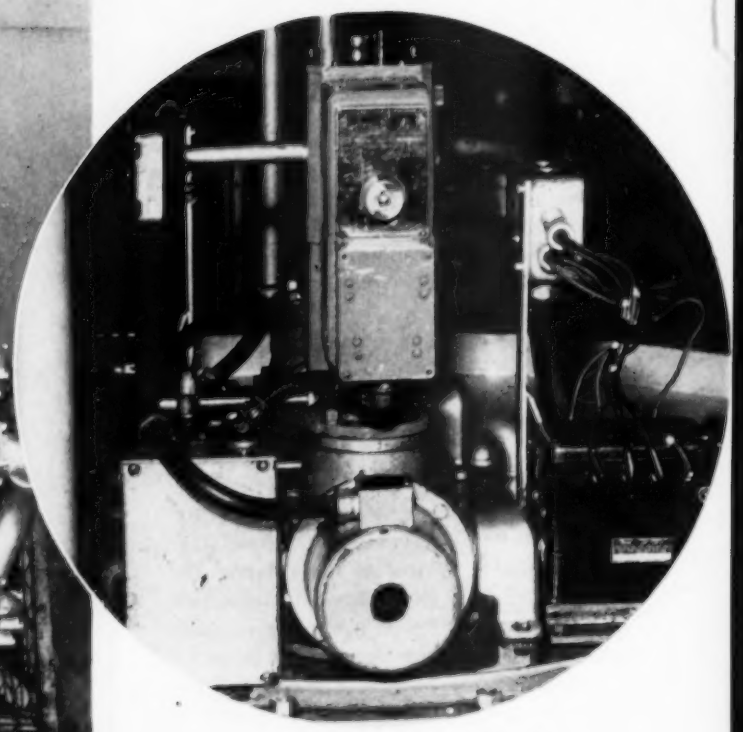
A spectacular end view looking down the aisle to the right of Building 42, Reynolds Metals Power Plant, Corpus Christi, Texas, showing in the immediate foreground the American Air Filter's automatic air filter and then behind it one of the 41 Maxim silencers and to the right another view of the Young Radiator installation which you see on the opposite page from a slightly different angle.

The engines are cooled by radiators located outside the building, one radiator cubicle being provided for each engine. This arrangement makes each unit an independent power plant, thus not disturbing any other unit if shut down. The radiators are of the familiar dual construction of both water and oil cooling core.

The engine water and oil temperatures are regulated by Fulton Sylphon temperature regulator valves in the lines controlling the temperatures by regulating the amount of water or oil allowed to pass to the radiators. The remaining water or oil by-passes the radiator and returns to the engine. A regulator head on the valve is controlled by a bulb located just after the filter in the case of the oil, and in the line from the engine in the case of the water. A non-chromate type of corrosion inhibitor is used in the cooling water to minimize corrosion in both engine and radiators.

The electrical and engine controls are all combined in one panel shown by Figure 1. On the left and at the bottom from left to right are the accessory starting button, the engine starting control, and the engine starting button. The large black panel in the center of the left side is the scanning pyrometer which shows the individual cylinder exhaust temperatures, generator bearing temperatures, and the generator cooling air temperatures. All other engine temperatures and pressures are indicated by the gauges on this side of the panel, except the engine tachometer





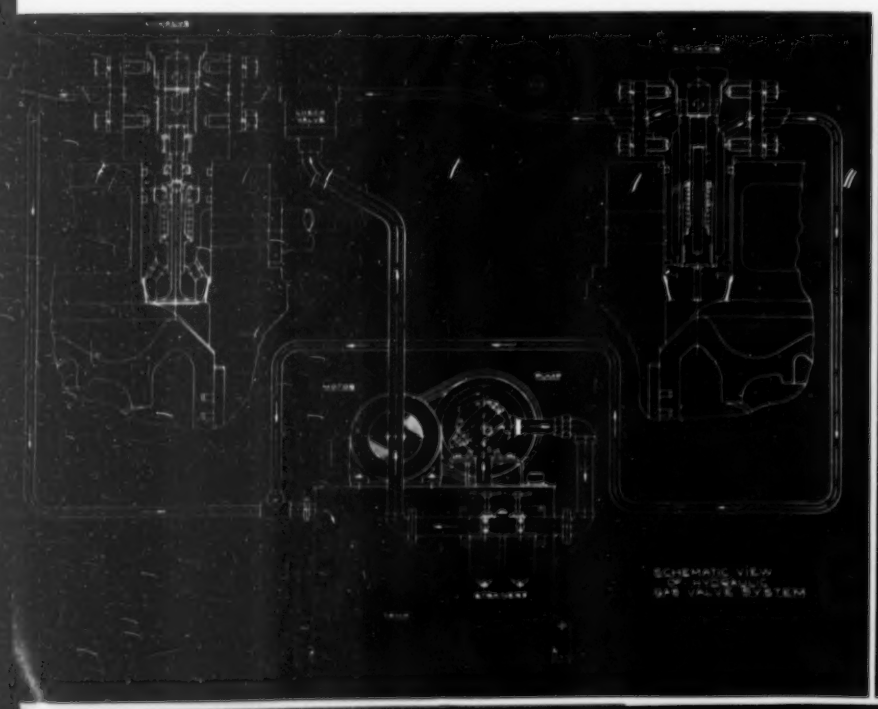
A closeup of the top of one of the 41 GM engines showing the Marquette hydraulic governor and to the right the Scintilla battery timer.

Looking down on top of one of the GM engines from the crane which indicates how little vibration characterizes not only any one engine, but all 41 engines in this big power building. The principal components you are looking at are again the Marquette governors and the Scintilla battery timers.

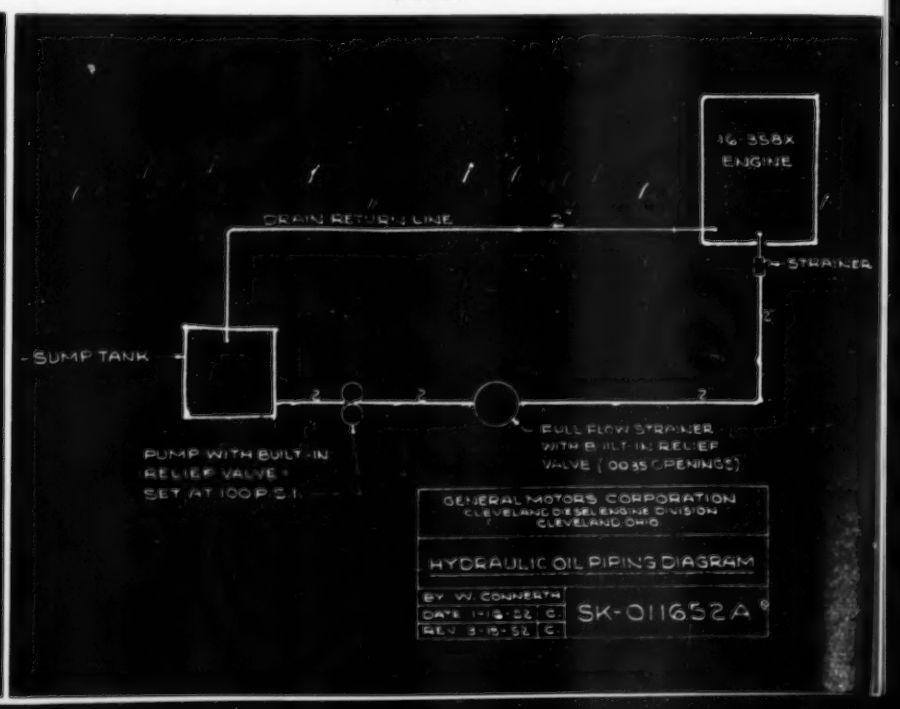
located on the right with the electrical meters. The meters at the top of the right side of the panel, from left to right, show engine speed, engine hours of operation, line volts and line current. The group of hand controls at the bottom of the right panel are breaker and rheostat controls for the electrical circuit, except the engine speed control which is on the left end of the center row. The control at the far lower left corner is the emergency breaker trip which disconnects the engine from the power line and can be used in an emergency. In the event of a high oil or water temperature the red light at the top of the panel lights and a locomotive-type horn blows, notifying the attendant who can then correct the situation. When the engine is operating satisfactorily, a white light shows on the instrument board.

The natural gas for combustion comes from the main line at a pressure of 90 psi. Two main gas lines, one on each side of the building, run the entire length. At each engine the gas pressure is reduced from 90 psi. to 50 psi. by a gas regulating valve. Then it passes through a surge tank to an automatic shut-down valve, through a governor controlled valve to the engine manifold and then to each individual cylinder. The governor controlled valve meters the gas to each engine depending upon the load. Just before the governor control valve there is an overspeed poppet valve which shuts off the gas to the engine in the event it should overspeed.

Fig. 3. A schematic view of the hydraulic gas valve system which is described in more detail in the accompanying text. The strainers are by Cuno.



Here you have the hydraulic piping diagram to match against Fig. 3 which adjoins. This has proved to be a very effective design in maintaining even distribution of fuel to all 16 cylinders.



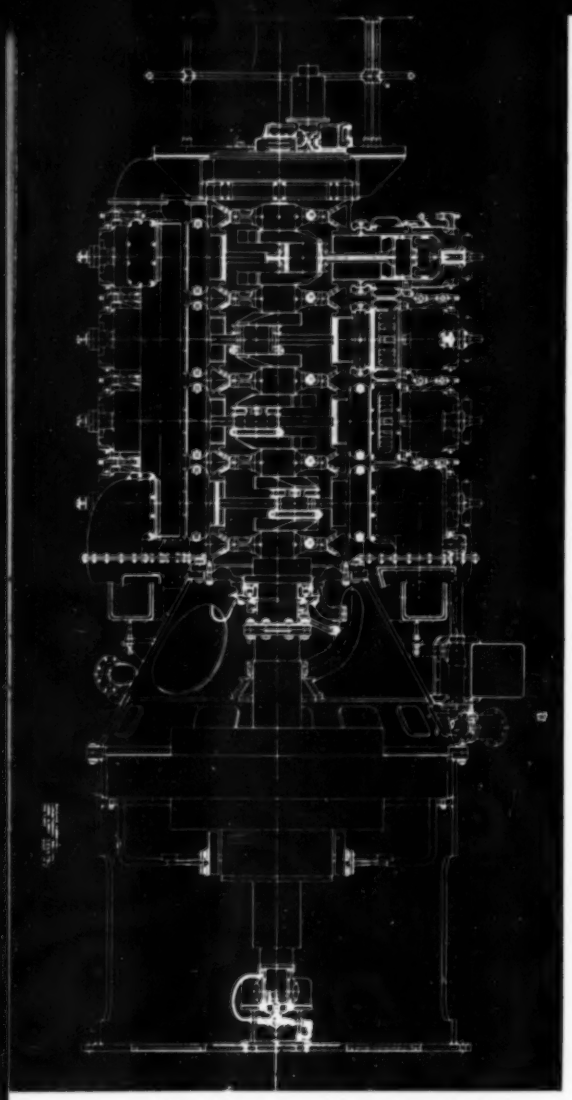


Fig. 4. A cross-section of one of the vertical GM engines at Corpus Christi which gives you the relationship between the engine and the generator and between one bank of 4 cylinders and the other three banks of 4 cylinders.

This Building 42 is approximately 560 ft. long by 60 ft. wide and 47 ft. high, and is arranged in two levels. The upper level is the main operating floor for the engines and the engine auxiliary controls. The lower level provides the required space and facilities for the actual auxiliary units, the piping headers, the main generators, and the like. A center aisle, on both floor levels, of approximately 15 ft. wide extends the full length of the building. Each building bay is 22 ft. long, except for one 10-ft. bay; thus a symmetrical arrangement of equipment exists with a pair of units—one on the left and one on the right of the center aisle—installed in each bay throughout the entire length of the building, except for three bays selected at about the halfway length point of the building. These are devoted to electrical equipment, excitation M-G sets, distribution transformers, building service control panels, and so forth.

Fig. 5. A cross-section of one of the 4-cylinder sets showing how the connecting rods, pistons and crankshaft actuate together.

The last building bay, opposite the pot line area, is set aside for incoming rail transported equipment, dock facilities, and the like. The next to last building bay includes the 41st engine on one side of the main aisle, while the other side is available for storage or such assignment as seems appropriate from time to time.

Immediately outside the building proper, on either side of each 22-ft. building bay, are located radiators, air intake filter units, air ventilating units, exhaust mufflers, and hot air exhaust stacks, to serve the adjacent engine-generator units. The space allowed for these auxiliaries and accessories extends out from the building approximately 48 ft.

Since all units are identical, along with their respective auxiliaries and accessories, and also their arrangement is symmetrical, it is convenient to explain, as well as to appreciate, the general aspect of the power plant by considering an individual unit, then mentally applying a multiplying factor of 41 to arrive at the ultimate expanse of this outstanding power plant.

On the operating floor level, at or nearby each engine, are located (1) the engine-generator control cubicle, (2) the auxiliary motor and battery ignition control cubicle, (3) positive and negative main generator line circuit breakers, (4) main line disconnect switches, (5) generator field rheostat, and (6) engine fresh water system expansion tank. The floor opening space for the engine-generator unit is 15.5 ft. by 15.8 ft. with the engine above the floor line. The generator, with the generator housing enclosure, constitutes the engine supporting base extending below the floor line. The space within the 15.5 ft. by 15.8 ft. boundary and the engine periphery is made up of grill flooring through which ventilating air rises from the area below to constantly ventilate the operating space area.

Below the operating area of each engine, or on the lower level, and serving each engine, are found the motor-driven auxiliary units and accessories, approximately as follows: (1) 30 hp. motor-driven lube oil pressure pump unit, (2) 25 hp. fresh water circulating pump unit, (3) 200 hp. motor-driven engine combustion air pressure fan unit, (4) 5 hp. motor-driven hydraulic system oil pump unit with tank and accessories, (5) 15 hp.

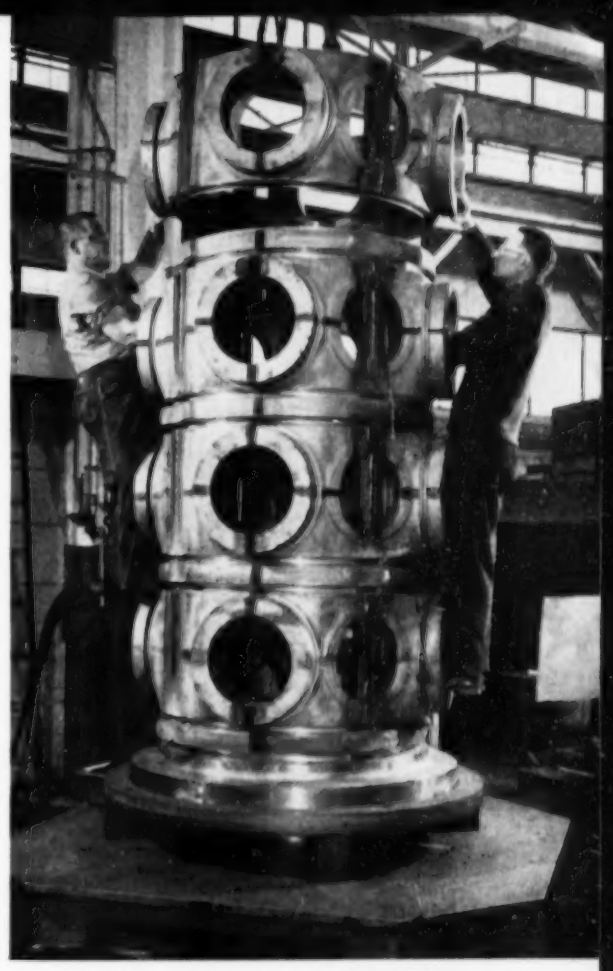
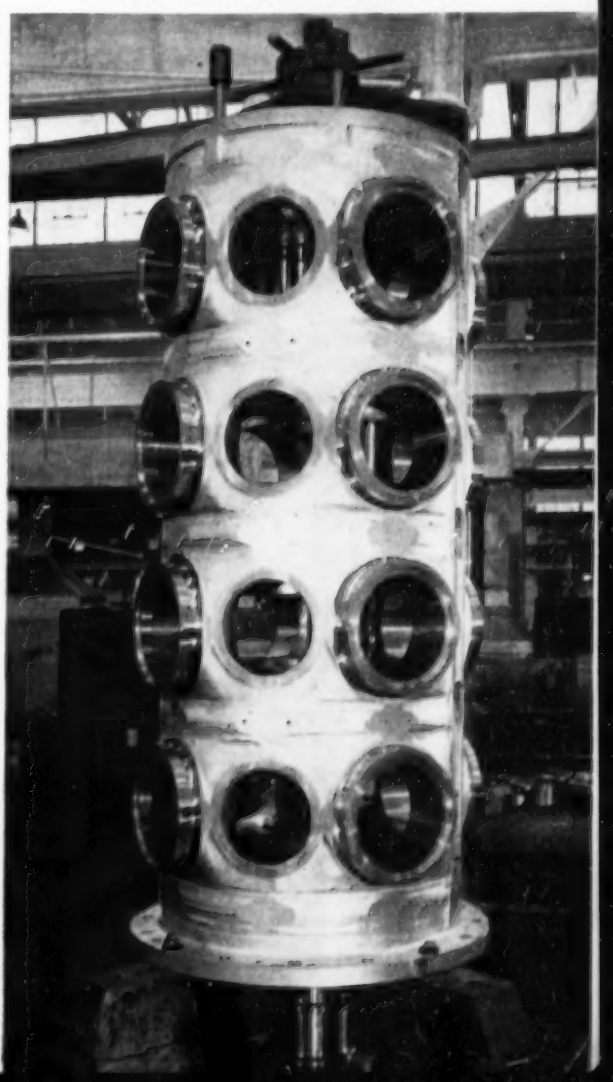


Fig. 6 very clearly indicates the method of building up the crankcase for these engines from steel forgings and then welding them together into the four units seen here.

Fig. 7. One of the welded steel crankcases with crankshaft installed showing simplicity of design and construction.



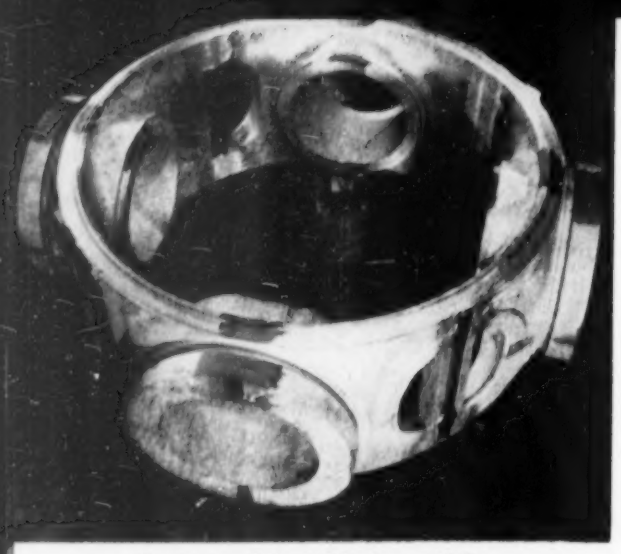


Fig. 8. One of the steel forgings welded into a 4-cylinder segment—see Fig. 6.

Fig. 9 shows the clamping rings that are used to tie together the cylinder to the crankcase.

Fig. 10 illustrates one of the 16 cylinders on the model 16-358 GM engines.

motor-driven [illegible]rator air ventilation fan unit, (6) 1 hp. mo[illegible]riven engine crankcase ventilating unit, (7 [illegible]e oil line strainer, (8) lube oil filter, (9) oil st[illegible]ge and run tank, (10) oil and water temper[illegible] regulators, (11) oil pressure relief valves, (12) natural gas surge tank with fittings, (13) [illegible]pressure regulator, strainer, relief valve, (14) gas line remote control shut-off valve, (15) direct reading pressure gauges and thermometers, (16) piping for gas, oil and water, exhaust and air, (17) generator current measuring reactor unit, (18) control cable and wiring, (19) auxiliary motor local control pushbutton stations, (20) other minor devices as necessary. It is of interest to note that with the exception of incoming gas line, and lube oil header line facilities, there are no inter-communications of piping or control wiring between adjacent units. These exceptions are common facilities serving all engines from headers, much the same as building service air is brought to each unit by a common header for cleaning or air tool uses. All motors above identified are very conservatively rated—actually being operated at below their name plate rating, and are totally enclosed (except for the 200 hp. motor which is equipped with auxiliary heaters) to cope with the extremely wet humidity conditions in the Corpus Christi climate.

The three central bays contain the general building service apparatus, and the electrical machinery which is common, either to all engines or common to the bus line. This, therefore, includes such items as (1) unit sub-station to transform power from 4160 to 480 volts, and provide distribution thereof, (2) building lighting and ventilation sub-stations and distribution units, (3) excitation M-G sets with their control panels, (4) amplidyne excitation units with their control, circuit breaker storage batteries and control panels, and other essential items.

Adjacent to each generator, a separate motor-driven blower unit takes a portion of the inlet air and forces it through a circular duct around the upper part of the generator housing, thence down through the generator from the top, and finally down and out the bottom of the generator concrete base, where an underground duct carries the hot generator air outside the building and discharges it upward into the main hot air stack above the radiator unit. Clean air thus ventilates the generator at all times, and carbon dust occasioned by brush wear is carried out of the generator enclosure in the discharge air stream.

The remainder of the air within the lower level building area flows upward, passing over the engine, control cubicles and operating space in its path, and finally upward and out the ventilator at the peak of the building.

Since the purpose of the power plant is to deliver dc. power to No. 2 pot line on single bus, all units selected to run on a given load demand must operate electrically in parallel. This means that each engine operates at full speed, full load, and at bus voltage, whenever in operation. Speed of an engine is set up to the proper value when it is started up and put on the line, but from this point on, loading and variation of voltage is done on all engines by a single operator who is located at the main load master control panel for the pot line.

This load control panel is contained in an annex building located between Buildings 41 and 42. The operator at this station observes which units are running by means of indicating lights and can manipulate load and voltage as though all units running were one generator rather than several. Furthermore, he can trim load on any individual unit as needed to make it equal the load on any of its neighboring units.

When several engine-generator units are running and their loads are all under the control of the

Fig. 11. One of the liners showing the location of the air intake and exhaust ports. Again you have simplicity of design, ease of maintenance.

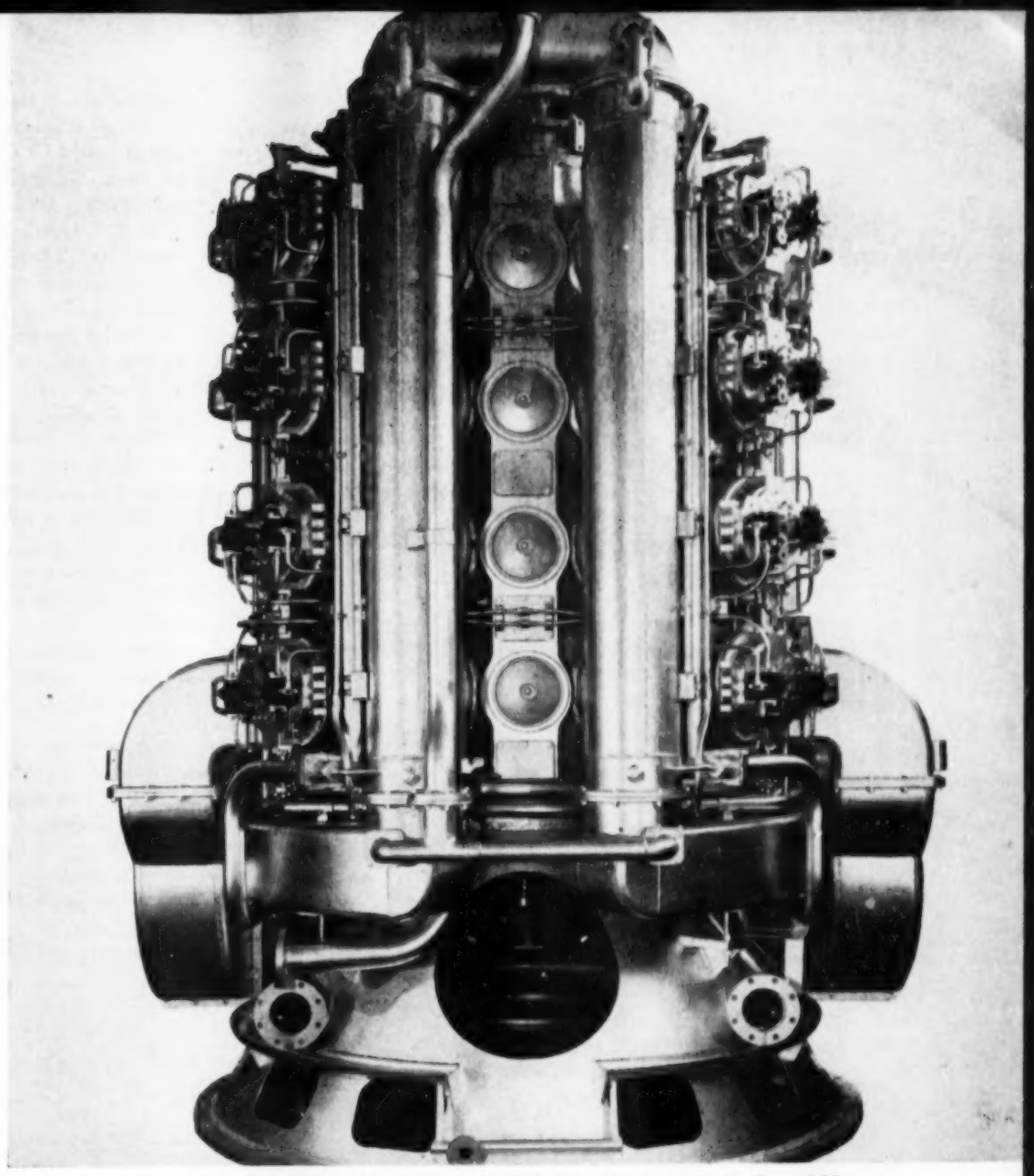
Fig. 12 gives you the piston-connecting rod assembly with four Perfect Circle compression rings at the top and two Sealed Power oil rings at the bottom.

operator (as above explained) who is at quite some distance from the engines, it suggests immediately that the respective engines, along with their auxiliary units, must automatically ascertain as far as possible if unfavorable conditions are developing. A rather elaborate alarm system detects unfavorable conditions throughout the oil, gas, water, exhaust and generator bearing systems, and produces both visual and audible signals to the engine room attendants.

Now that concludes my comments on the installation of the 41 General Motors engines here at the Reynolds Metals Power Plant, Corpus Christi. But because this engine is unique in many details I am now going to take a few pages to illustrate and describe the engine as an engine and bring to your attention its principal features of design and construction which I sincerely hope that you will find as interesting as I have found them this week.

These engines are of very unique construction. They are 12½-in. bore by 14½-in. stroke, 16-cylinder, 2-cycle, loop-scavenged gas engines. The pistons operate in a horizontal plane from a vertical crankshaft as shown in the engine longitudinal section, Figure 4, and engine cross-section, Figure 5. The gas is admitted into the cylinder through a hydraulically operated gas valve during the beginning of the compression stroke. The gas and air mixture is then compressed and ignited by a spark plug in the center of the cylinder. The gas valve for admitting the gas into the cylinder head is hydraulically operated by an actuator in the preceding cylinder of the same row, as shown by Figure 3. The air for combustion is supplied by a separately motor-driven blower, and enters the piston space through the air intake ports located in the lower part of the cylinder, as shown by Figure 5.

The General Motors section of this power plant consists of 41 gas engine generator sets in two



A shop view of one of the 41 engines installed at Corpus Christi in the General Motors Building 42 of the Reynolds Metals Company, visualizing the simplicity, compactness and ease of maintenance of this 2000 kw. spark ignition natural gas engine.

Fig. 13 illustrates the main bearing arrangement. The three main bearing carrier segments hold the main bearing in the crankcase.

Fig. 14 shows the simplicity of what might normally be a very complicated problem—that of operating 4 cylinders from one central bearing.

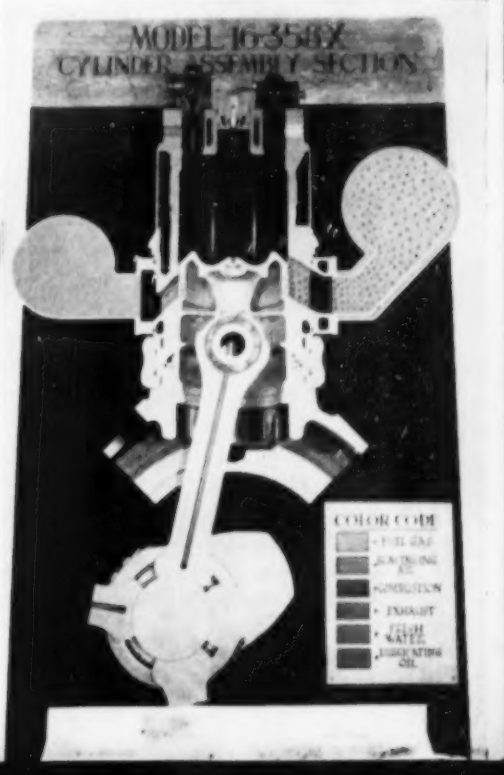


Fig. 15 was originally a model in color which visualizes the cycle of operation of this Cleveland Diesel Division of General Motors Corporation model 16-358 engine.

rows. A diagrammatic sketch of a cross-section through the power plant is shown by Figure 6, and a model of one engine generator set with engine operating accessories is shown by Figure 7.

The engines are mounted on a foundation consisting of a concrete pad and large concrete cylinder for mounting the engine. The reinforced concrete pad is 2½-ft. thick, 14 ft. wide, and long enough for about 10 engines. Upon this pad was poured a large reinforced concrete cylinder about 14 ft. in diameter and 8 ft. deep. Into this foundation cylinder is cast a hole for the generator cooling discharge air which was noted in Figure 6, "The Building Section." The engine accessories, which are all motor-driven, are set on individual foundations. The size depends upon the specifications of the accessory.

Referring back to Figure 4, you get a good visual idea of how this engine is assembled as a 16-cylinder vertical unit and in the case here, driving a generator located beneath the main floor and suspended from the engine crankcase.

In Figure 5, the method of tying together the four pistons to the common crankshaft is well visualized. Actually, of course, this 16-cylinder unit is nothing but four separate rows, so to speak, each with 4-cylinder units mounted one on top of the other. This is well visualized by Figure 6, where the type of construction of the master crankcase is well illustrated. The crankcase is a built up steel unit made up of four separate divisions. In this Figure 6, the fourth or top unit is being assembled for final welding. In Figure 8, you find one of these segments, or sections which has just been welded together from four separate steel forgings to make the unit.

In Figure 7, the final crankcase with crankshaft in place is illustrated visualizing again the simple method of welding steel forgings together and then welding the four sections one to the other. The result is a very strong, rigid crankcase reasonably light in weight but well able to take the strains and stresses which it naturally has to absorb when in full operation.

Figure 9 gives you an illustration of the clamping ring or band which holds the cylinder to the crankcase, so that it is easy to quickly disassemble the cylinder from the engine.

Figure 10 is the cylinder, and Figure 11 is the liner. Then in Figure 12 you have the piston and connecting rod assembly. The engines here at Corpus Christi, which are, as you know, natural gas engines, have four piston rings at the top and two oil rings at the bottom. The engine as built for horizontal service as a full diesel has three rings at the top and two oil rings at the bottom.

Figure 13 shows the main bearing carrier and Figure 14 the connecting rod assembly for each 4-cylinder unit. Very simple design, very easy in maintenance, very effective in day by day service.

Figure 15 is a diagrammatic sketch showing how the engine w[illegible] how the air gets in, how the exhaust gase[illegible]ut and how the fuel is fed in. This general [illegible]iption of Model 16-358 General Motors [illegible]e has in the main, of course, been restricte[illegible] the 41 engines here at Corpus Christi. But [illegible] last two pages of this section we are illustr[illegible] this same model 16-358 General Motors u[illegible]s a horizontal engine for use in natural gas and petroleum pipelines; for marine applications; for generator drives; for any application in the general industrial power field where a compact, reasonably lightweight, economical diesel engine (which can, of course, be arranged to operate as a spark ignition engine where natural gas is available) can be used to advantage. It is anticipated that this compact, powerful unit, capable of supplying 3300 hp. for continuous service, will find a ready and expanding market. Its principal features of design are not materially different from these 41 engines down here at Corpus Christi; only the necessary details to change it from a spark ignition natural gas engine to a diesel engine have been made. Full accessibility is arranged for maintenance.

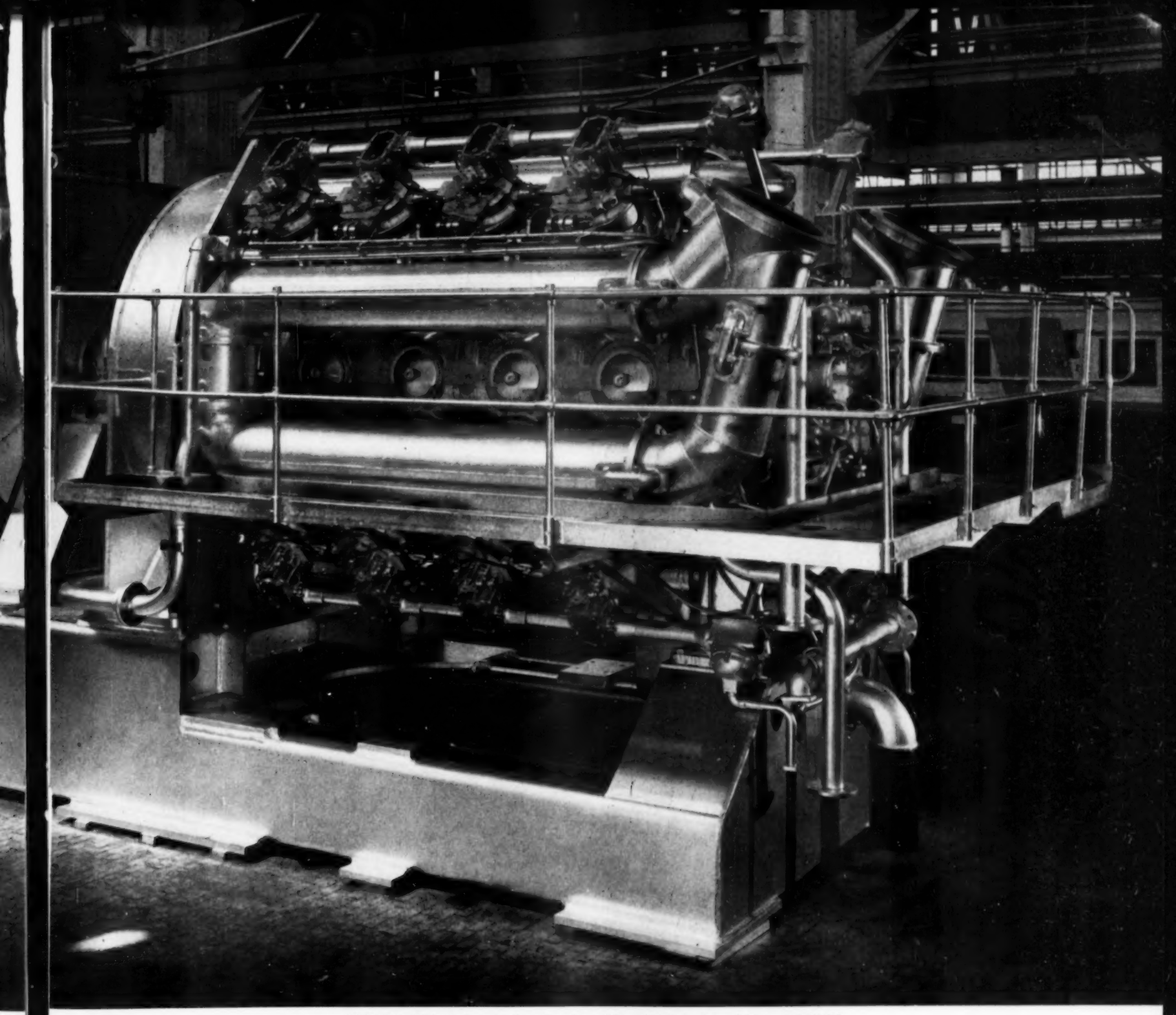
As I bring this section to a close I want to extend my sincere appreciation for the active, helpful cooperation extended me by Mr. D. P. Keller, plant manager for the Reynolds Metals Company's San Patricio aluminum smelter; to Mr. Frank Terry, power plant superintendent, who is in charge of all three of the power plants in Buildings 40, 41, and 42. Much of the technical detail given you in this article was checked and double checked for me by Mr. Paul Louzecky of the Cleveland Diesel engineering staff from Cleveland, who was ably assisted by Mr. S. M. Baltes, who is the Cleveland Diesel guarantee engineer here at Corpus Christi.

List of Equipment For General Motors Engines

Engines—41 16-cylinder, vertical, 2-cycle, loop-scavenged gas engines, bore 12½ in. by 14½ in. stroke, rated at 2000 kw., at 575 rpm.
Generators—General Electric, 2000 kw., dc., 575 rpm., 725 volts, 40°C. rise, Class B, insulated.
Hydraulic engine governor—Marquette.
Exhaust silencers—Maxim.
Engine and building intake air filters—American Air Filter Co.
Lube oil and jacket water radiators—Young Radiator.
Building ventilating fans—Joy Mfg. Co.
Engine lube oil pumps—DeLaval IMO.
Lube oil filters—Hilco Full Flow.
Engine control cubicles—General Electric.
Auxiliary motor control cubicles—General Electric.
Scanning pyrometers—The Bristol Co.
Thermometers—Palmer Co.
Pressure gauges—Wexler Gauge.
Alarm system pressure controls—Detroit Controls.
Radiator fan and heater circuit control—Detroit Controls.
Gas tank relief valves—Kunkle Valves.
Engine water temperature regulators—Fulton Sylphon.
Lube oil temperature regulators—Fulton Sylphon.
Lube oil relief valves—Kunkle Valve.
Lube oil transfer pumps—DeLaval IMO.
Viscosene transfer pumps—DeLaval IMO.
Lube oil and viscosene meters—Bowser, Inc.
Lube oil reconditioners—U. S. Hoffman.
Viscosene reconditioners—Sharples Corp.
Spark ignition coils and timers—Scintilla.
Motor generator sets—General Electric.
Lube oil—Magnolia 40.
Storage batteries—Exide.
Expansion joints—Zallea.
Engine air supply blowers—Sturtevant Div., Westinghouse.
Engine bearings—Allison.
Cylinder pressure indicator valves—Kiene.

G-M MODEL 16-358—SPECIFIC DATA

Bore—12½ in.
Stroke—14½ in.
Number of cylinders—16.
Type of engine—2-cycle.
Operating speed—575 rpm.
Engine rating—2000 kw.
Number of main bearings—5.
Dia. main bearing journals—10 in.
Length main bearing journals—8 in.



THE BIG NEWS! For the first time in public print it is the privilege of DIESEL PROGRESS to bring you an illustration of a new addition to the line of Cleveland Diesels —model 16-358 arranged for horizontal operation and now offered by the General Motors Corporation, Cleveland Diesel Engine Division, for generator drive, petroleum pipeline operation, for marine applications, and for the 101 other industrial uses to which this powerful, compact diesel engine can be used efficiently and economically.

Dia. crankpin journals—8¾ in.
Length crankpin journals—8½ in.
Piston speed—1390 ft./min.
Air intake volume—14,000 cfm.
Exhaust gas volume—28,000 cfm.
Type of lubrication—Pressure.
Shipping weight (less generator lower base, and upper base cone)—59,000 lbs.
Total weight including generator and lower base—111,500 lbs.
Height, top of handrails to bottom of generator housing—25 ft., 5 in.
Height, bottom face of crankcase to top of governor—12 ft., 3 in.
Width, over-all, intake flange to opposite side—12 ft., 3⅛ in.
Width, opposite way—11 ft., 8¾ in.
Crankcase—Welded steel.
Crankshaft—Forged steel.
Connecting Rods—Forged steel.
Cylinders—Cast steel.
Cylinder Liners—Cast iron.
Segmental Main Bearing Carrier—Cast steel.
Connecting Rod, Retainer Ring—Forged steel.
Cylinder, Clamp Ring—Forged steel.
Piston—Cast iron.
Thrust Bearing—Kingsbury.
Thrust Bearing Housing—Cast steel.
Piston Rings, 4 Compression Rings—High temperature iron.
Piston Rings Oil Control, 2 Rings—Double hook with 40-lb. expanders.
Wrist Pins—Alloy steel, full floating.
Wrist Pin Bushings—Bronze, tin flashed.
Wrist Pin Bushings in Piston—Bronze.
Generator Bearing—Self-aligning bronze.
Gear Train—Steel gears, bronze bushed.
Overspeed Trip—Pawl type, mechanical.
Intake and Exhaust Housing—Cast iron.
Intake Manifold—Fabricated steel.
Exhaust Manifold—Fabricated steel, galvanized coated full water jacket.

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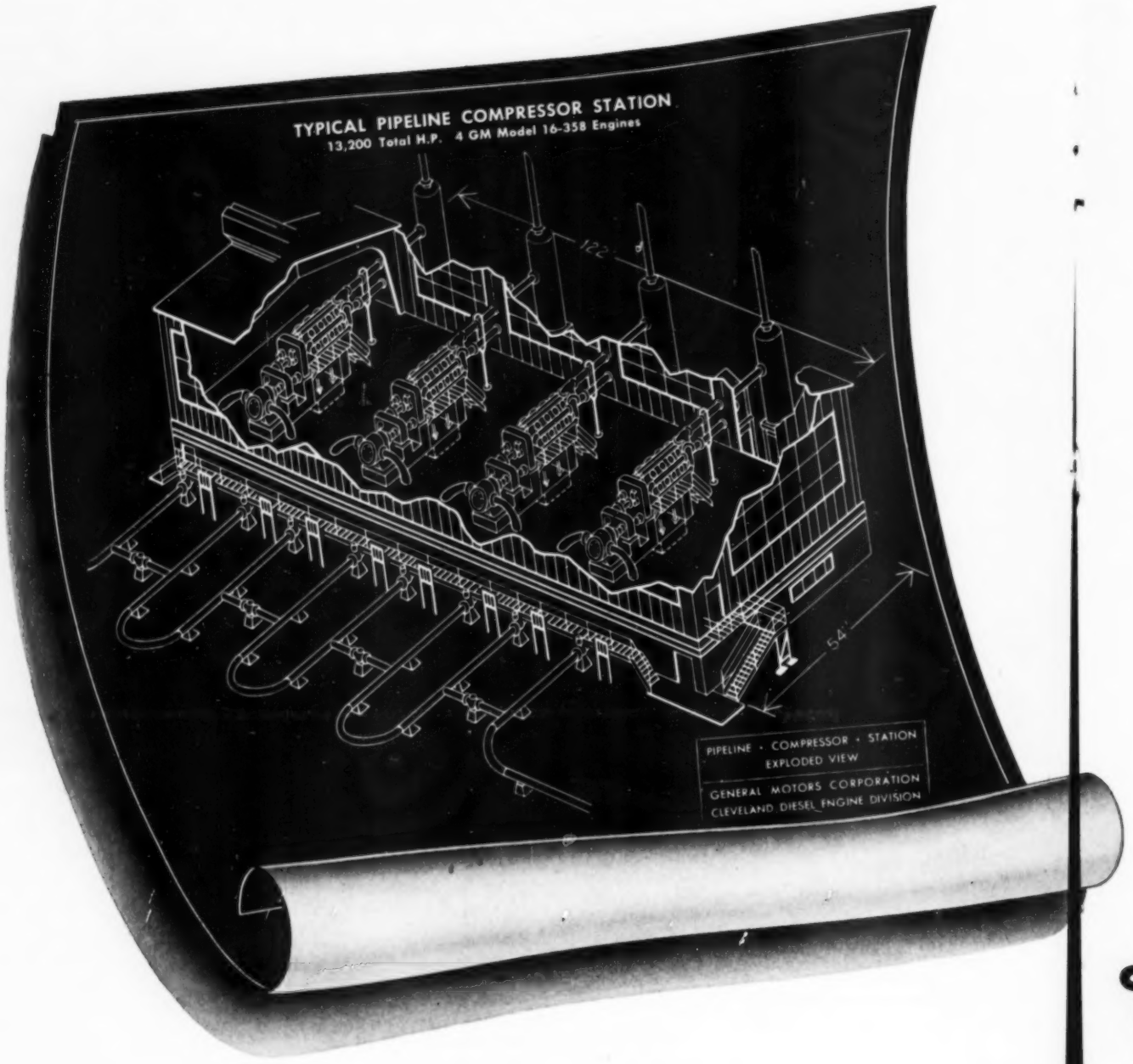

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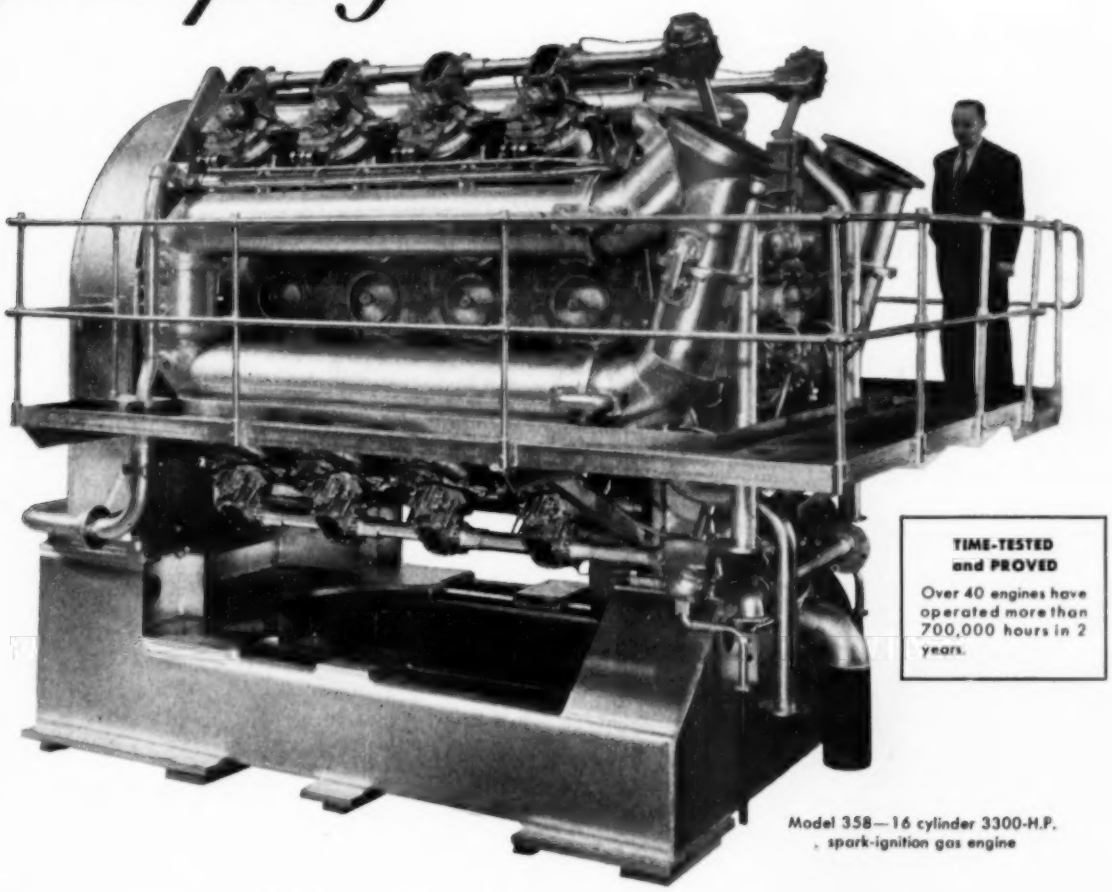

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BUILDERS OF DIESEL, DUAL-FUEL AND NATURAL GAS-BURNING ENGINES—FROM 150 TO 3300 H.P.

ANACONDA USES DIESELS IN STRIPPING OPERATIONS

By F. HAL HIGGINS

NEVADA's biggest mining news over the past two years has been made at Weed Heights where Anaconda Copper Mining Co. has been erecting its Yerington plant and opening a pit that has set new standards of mass production of low grade copper ore. Open pit operations had extended over 16 months at the time the processing plant was officially opened as executives of the great Anaconda company gathered recently from New York, Montana and numerous other operations.

The economics of the mining operations at the Yerington mine and the Leviathan sulphur mine, in California's Alpine county, are of great interest to engineers, diesel manufacturers and statesmen. These two pit operations focus attention on the modern place of diesel trucks in cutting costs from the oil railroad transportation of ores. The sulphur ore mined by stripping methods at Anaconda's Leviathan mine are transferred the distance of 58 miles to Weed Heights for process in the company's fluo-solids and acid plant, the resultant product of sulphuric acid being used in the leaching process for the recovery of the low grade copper ores mined at the Yerington mine. The transportation of the sulphur-bearing ores necessitated the special construction of roadways from the main highway in Nevada up the mountainous terrain to Leviathan where the sulphur deposit is located. This roadway was constructed in record time at an elevation of more than 7000 ft. during winter weather.

According to the local management of the Yerington properties, the Yerington open pit mine, which is Nevada's newest, came about as a result of the decision made by Anaconda officials in New York in November, 1951. Faced with world conflicts and a shortage of copper in the nation, company officials turned to the Yerington property as one that could be placed

A Mack diesel truck brings in a supply of oxygen and acetylene from Reno for Anaconda.

Electric shovel loads ore into a Dart truck. Each of the Darts is equipped with a torque converter to eliminate gear shifting and assure a smooth flow of power from the Cummins diesel engines powering the units.

One of four P & H 5-yard electric shovels at Anaconda's Yerington pit loads a Dart truck in operation to remove overburden.

William Cross, Yerington garage foreman, runs one of the largest and best equipped garages in Nevada.

in operation in the shortest time. The Anaconda company had explored the ore deposit for a period of years prior to the decision to open up the new pit.

When the decision was made to place the Yerington mine in production, A. E. Millar, then connected with C. E. Weed's office in New York, was named general manager and was in charge of the development and opening up of the Yerington and Leviathan mines. At the same time H. R. Burch was named mine superintendent and A. J. Gould was named metallurgical plant superintendent. Early in 1952 machinery and workmen started arriving in Yerington and in June of 1952 the first electric shovel loaded the first truck of overburden from the new pit. In the next 16 months an enormous hole was opened which extended 3000 ft. in length, 1500 ft. in width and some 150 ft. in depth. It was necessary in order to expose the deposit of oxide ore to remove in excess of 10,000,000 tons of overburden. During the construction of the processing plant the electric shovels and diesel trucks worked around the clock in removing the waste overburden and at the same time stockpiling low grade ore which had to be removed in order to uncover the major portion of the mine deposit prior to the time the processing plant was completed and ready to operate.

The machinery used in this open pit mine is of the latest design, some of it being relatively new in the mining industry. Take for example the Joy rotary drill which drills a blast hole to a depth of 50 ft. in one hour or the equivalent of 6 hours of work for the old type of churn drill. Each rotary drill hole is loaded with 190 lbs. of powder which breaks 1520 tons of rock. The haulage trucks used at the Leviathan and Yerington pits are Darts, manufactured by the Dart Truck Co. of Kansas City. Each truck is equipped with torque converters to eliminate gear shifting and allow a smooth flow of power from the Cummins diesel engines. At the Yerington pit 4 P & H, 5-yard electric shovels are utilized for the stripping of waste and also for the loading of the ore. At the Leviathan pit two 1½-yard P & H shovels are used for loading the ore, the stripping of overburden at Leviathan being done by a local contractor. The open pit at Weed Heights differs from the ordinary open pit mine in that the height of the benches is 25 ft., which lends itself to selective mining necessary here. Some 120 men are employed in the pit as shovel operators, truck drivers, oilers, drillers, bulldozer operators, pitmen and laborers.

Significant of the size of this operation is the vast quantity of equipment in operation, including: 30 Dart trucks powered with 300 hp. Cummins diesel engines; 7 General Motors trucks, some of which are used as water trucks and others as dump trucks; 6 P & H shovels of which 4 are 5-yard electric, the other two at Leviathan are 1½ yards capacity; 4 Diamond T diesel trucks for hauling light-gauge scrap iron used in the precipitation of copper and for hauling copper precipitates to the railhead from processing plant; 7 Caterpillar D8 tractors; 3 Caterpillar motorgraders; and other miscellaneous equipment. Complete service shops have been constructed and are in operation for all maintenance and repair work on the equipment used at the job. The garage at the Yerington mine is one of the largest and best equipped in Nevada. A machine shop equipped with the latest lathes, shapers, presses, etc., operates at this plant for the repair and fabrication of all equipment.

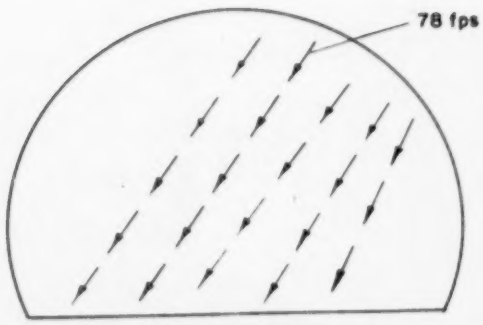
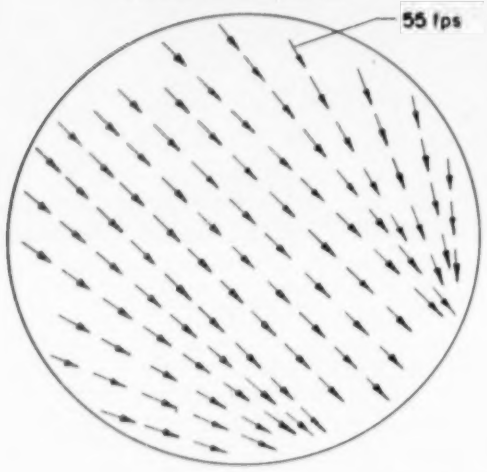


Fig. 2—Vectors representing average directions and the speed of flow of injected fuel, as seen through lower cylinder wall parallel to axis of crankshaft.

Fig. 3—Vectors representing average directions and the speed of flow of products of combustion during exhaust blowdown in GMV engine.



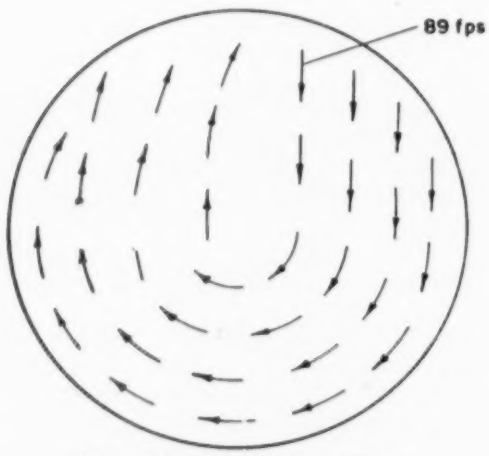
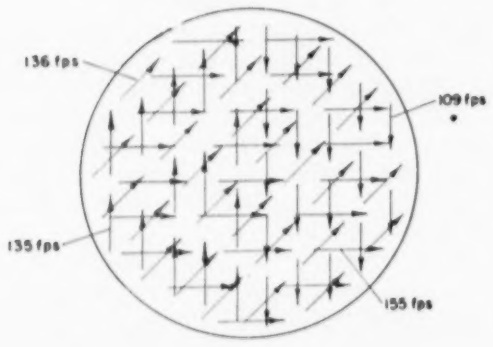


Fig. 4—Vectors representing average directions and the speed of air swirl after scavenging.

Fig. 5—Dominant gas movements within cylinder of GMV engine during scavenging period.



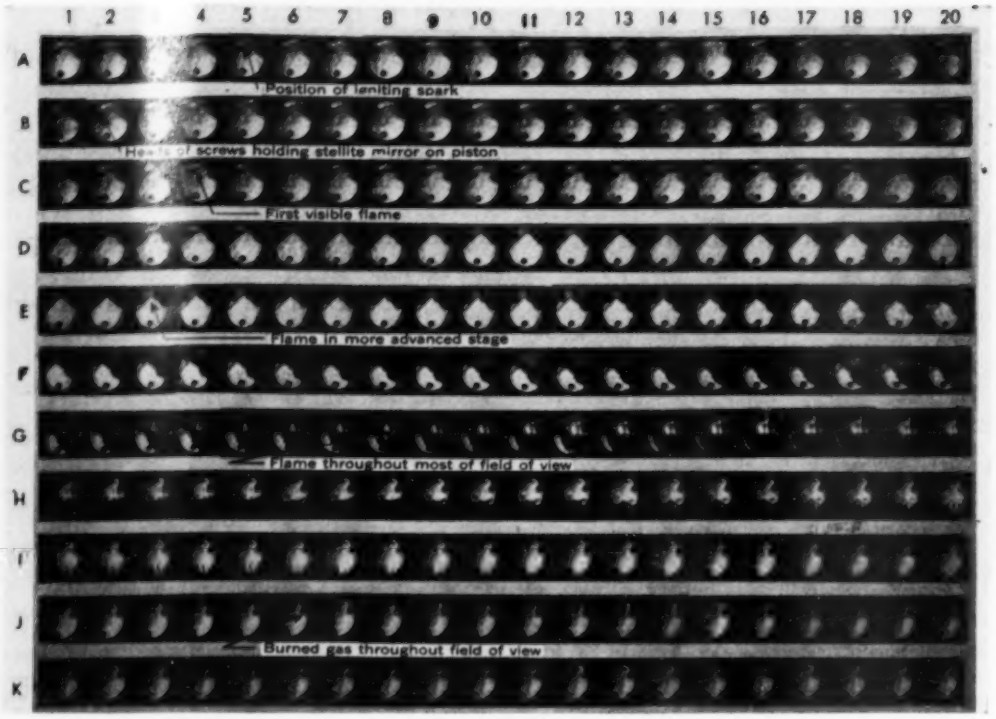


Fig. 1—High-speed schlieren photograph of flame taken through window in cylinder head of Cooper-Bessemer GMV engine at 20,000 frames per second with Isotran camera.

LOOKING INSIDE FOR THE ANSWER

CAN the efficiency of gas engines be improved still further? That has been a burning question facing development engineers at Cooper-Bessemer Corp. for many years. To find the answers Cooper-Bessemer researchers embarked on a long and costly development program. Working behind locked doors for several years, the researchers have added another piece to an engineering puzzle of attaining more and more horsepower with less fuel.

The importance of obtaining the most work out of every ounce of fuel becomes appreciated when one considers the astronomical amount of engine power at work in industry today. In this country alone there are over 1,250,000 horsepower engines driving Cooper-Bessemer compressors on pipe lines, in refineries and chemical plants. If on just these compressors, fuel consumption could be cut by only one-half cubic foot per horsepower hour, it would be possible to save 12 million cubic feet of gas a day, or over four billion cubic feet of gas per year.

Fuel costs are a very real problem to the gas transmission industry. Pipe line operators are faced with the dilemma of the rising costs of natural gas at the wells and fixed rates for gas at the distribution level. As a result, pipe line operators are ever alert to any savings in the fuel which is bled from the transmission lines, to feed the engines that drive the compressors. With this problem in mind, Cooper-Bessemer decided to investigate more thoroughly just what goes on inside a gas engine cylinder when fuel is burned. By knowing exactly what action takes place, Cooper-Bessemer engineers felt they could possibly discover new principles of combustion that would bring about modifications in engine design and so get more horsepower from each unit of fuel. The resulting study of combustion under actual operating conditions, using a super high-speed camera, Cooper-Bessemer feels more than repaid the operating time and expense involved.

A typical sequence of events that takes place inside a gas engine cylinder is recorded on the film strips shown (Fig. 1). To achieve this record, the film was exposed at the rate of 20,000 frames a second. As a result, the time lapse between photo frames is 60 millionths of a second. Reproduced in the sequence photos are but 220 individual frames of one film strip. The first view (A-5) shows the gas mixture inside the cylinder as the spark ignites the fuel. The initial visible flame or combustion, however, does not occur until position C-4, giving the idea of the time lapse between the spark and actual fuel ignition. The flame spread can be seen through the film sequence to frame G-8 and then disappearing until frame J-6.

The mottled effect on the film exposures before ignition and after the flame is through burning is caused by so-called "stratification" or unmixture of gases within the cylinder. Fortunately for Cooper-Bessemer's photographic researchers, this stratification actually helped to improve their observations by informing the engineers as to direction and velocities of gases within the cylinder. Objectives of Cooper-Bes-

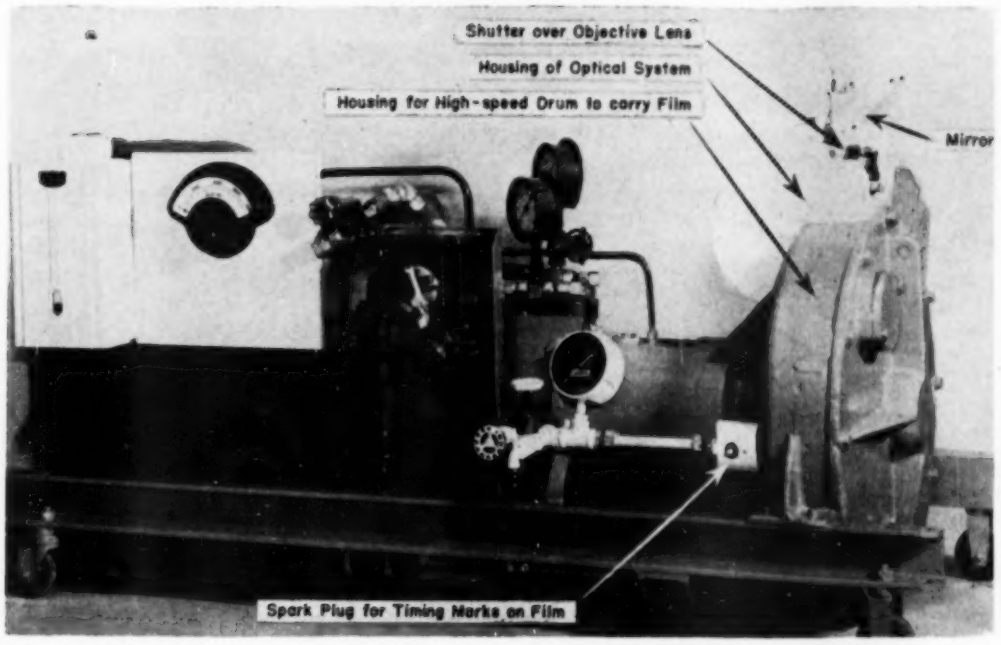

Shutter over Objective Lens
Housing of Optical System
Housing for High-speed Drum to carry Film
Mirror
Spark Plug for Timing Marks on Film

Fig. 6—Isotransport camera for operation in speed range 10,000-100,000 frames per second.

semer's high-speed motion picture study were such subjects as the shape and direction of the flame and turbulence or mixture of air and gas within the cylinder before ignition.

Scavenging, or removing of burned gases inside an engine cylinder, has always been a complex problem, particularly on 2-cycle gas engines. Since unburned gases hinder efficient combustion, Cooper-Bessemer wanted to revaluate the scavenging method at work in its own engines. The high-speed pictures supplied many of the answers to this complex problem. The film sequence actually shows how scavenging air enters the cylinder in highly turbulent jets causing an intimate mixing of fresh air with the residual burned gases from the previous combustion. This finding fortunately confirmed earlier predictions by Cooper-Bessemer designers when they developed the engine details to achieve nearly perfect mixing of the scavenging air with exhaust gases.

Another photographic finding indicated that combustion of gas-fuel progresses uniformly throughout the fuel-air mixture. This particular study supported previous theories that Cooper-Bessemer was providing for adequate turbulence or mixing of fuel and air within the cylinder prior to the time of ignition. Experimental tests further showed by contrast how faulty gas-air mixtures having rich or lean areas would fail to propagate the flame for complete combustion, thus reducing horsepower. Particularly evident was the advantage of gas fuel striking the crown of the piston to promote thorough mixing of fuel and air. The photographs indicate that gaseous fuels tend to flow or jet down through the center of the cylinder to the piston top rather than mix with the air on the way down. Vector analyses of average direction and speed of flow of gases within the cylinder are shown in Figs. 2, 3, 4 and 5.

High speed motion picture photographs had been taken of combustion within engine cylinders up to five inches in diameter. However, no prior studies have shown actual flow of air and gases inside an operating engine cylinder. Neither have previous pictures shown actual combustion of natural gas as fuel in engines. For their photographic studies, Cooper-Bessemer researchers selected the 14-in. bore by 14-in. stroke gas engine as powers the GMV angle type engine driven compressor. Working

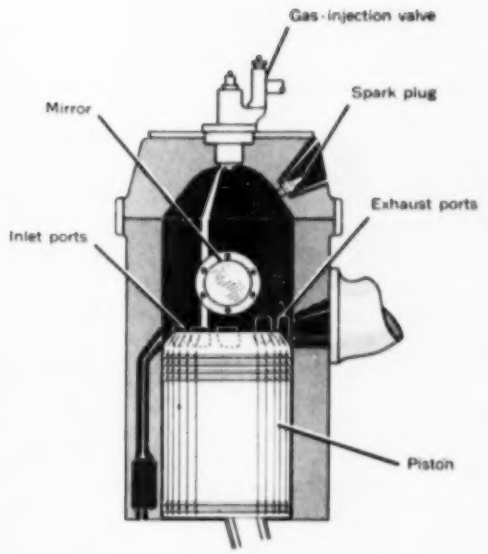


Fig. 7—Experimental arrangement for schlieren high-speed photography through cylinder head.

in conjunction with the Battelle Memorial Institute, Cooper-Bessemer engineers adapted the high speed Isotransport camera (Fig. 6) to the engine for the test.

The photograph in Fig. 7 shows a camera setup for photographing the combustion through the cylinder head of a Cooper-Bessemer GMV engine. This is but one of many such setups.

Cooper-Bessemer engineers feel that their power cylinder research has advanced the industry's knowledge of combustion several years as basically the efficiency of any engine depends upon how well it uses its fuel at the time of combustion. From its long-range research has come such developments as "Turboflow" and more recently the supercharging of 2-cycle engines with entirely exhaust-driven turbochargers. Fuel consumption of 10,000 Btu. per horsepower hour was once considered good. Today, however, fuel economies of 7500 Btu. are not uncommon, and in some cases 6500 Btu. has been attained. Cooper-Bessemer engineers look forward to even greater fuel economies in the future, thereby approaching the theoretical top level efficiency for gas engines.

Fig. 8—Experimental arrangement for schlieren photography through lower cylinder wall in direction parallel to axis of crankshaft.

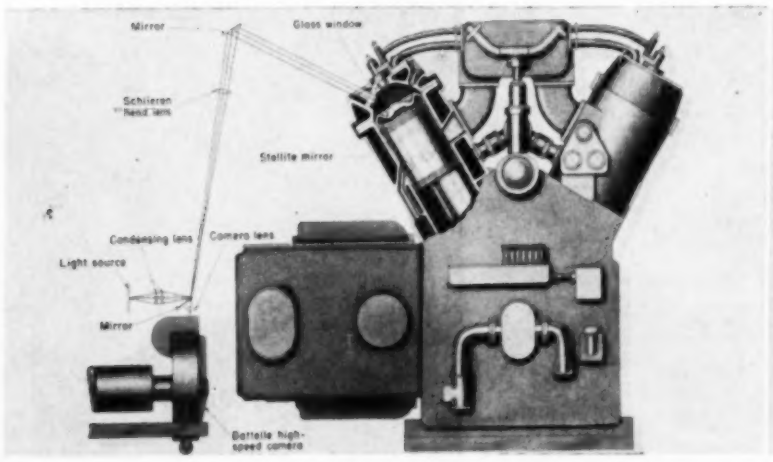
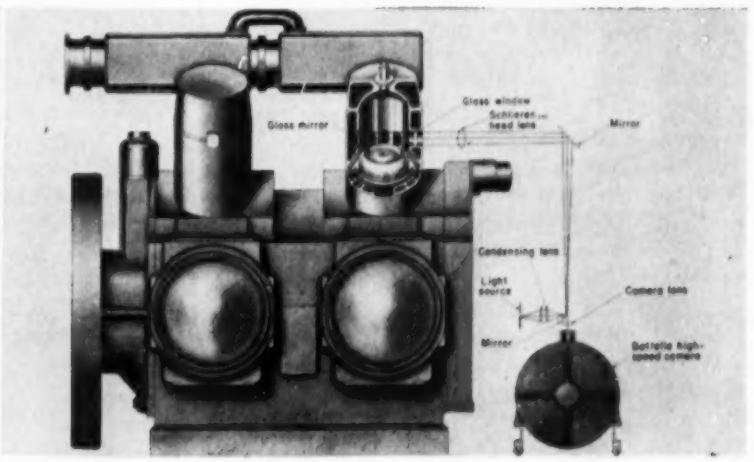


Fig. 9—Section of test cylinder showing orientation of field of view for photography through cylinder wall.



Three-stage torque converter on this Dart model 140 mining truck boosts work cycles and reduces round-trip time by providing accelerator-controlled converter drive and built-in hydrodynamic braking.

THE 3-STAGE HYDRAULIC TORQUE CONVERTER

The Second in a Series of Articles

WHEN the prodigious job began of lifting the mighty battleship *California* from the muck of Pearl Harbor, even the mildest skeptics were shaking their heads. The dieselized cranes assigned to the job were big and efficient, with plenty of horsepower. But the 32,000 tons of huge hulk were well-embedded in the mire fathoms below—and thousands of more tons had entered the ship in the form of sea water. Days later, when the masts of the great ship emerged from the sea, the engines of the cranes had operated at full governed rpm. with the driven load, for all practical purposes, at complete stall. The secret? Every crane was working through a hydraulic torque converter, a mechanical marvel of the 20th century, developed for two basic purposes: to put more available horsepower to work and to protect driving and driven equipment.

In short, the Twin Disc 3-stage hydraulic torque converters installed in the big cranes at Pearl Harbor permitted full power, full stall operation for hundreds of hours without stopping. And they applied a tremendous twisting force, up to six times the output torque of the engines, into the driven load constantly, with an infinite variety of ratios to meet the slightest variation in load demand while preventing engine lugging or stalling and eliminating nearly all the shocks, vibrations and torsional variations which occur between internal combustion engines and driven equipment on direct mechanical drive.

The torque converter is today as much a part of modern industry as the internal combustion engine itself. New applications are constantly being made of this remarkable device, for it has no parallel in solving the problems of starting powered equipment under loads—and meeting the demands of extreme running load variations—when either the starting or running load demands are well beyond the normal torque output of the engine. One of the earliest commercially available torque converters in the U. S.—for industrial diesel engine applications—was built by Twin Disc Clutch Co. in 1936 as a result of agreements with Ljungstroms Angturbin of Stockholm, Sweden, for the American rights on their Lysholm-Smith 3-stage design. Today's Twin Disc torque converters, though having various modifications and improvements of the original design, still function on the same principle as the Twin Disc model two decades ago.

Basically, the Twin Disc 3-stage torque converter is composed of three parts: the impeller or pump, the turbine wheel and the turbine housing. Accessory parts include auxiliary fluid pump, pump filter, reserve tank, pressure and temperature gauges, flywheel housing or chain housing on input end, chain housing or output shaft on output end and cooling radiator. In some models a clutch is incorporated between the engine flywheel and the converter pump wheel. The impeller—ball-bearing mounted in the end-plate—is available with various numbers of blades to meet varying power and speed requirements within each Twin Disc converter's size range. The turbine wheel utilizes three stages or sets of blades permanently riveted into a complete assembly, with the first two stages remaining the same regardless of engine size or requirements

and the third stage either "long" or "short," according to the rated horsepower capacity of the converter. It is the turbine wheel which transmits proper speed-torque ratio to the driven load. The turbine housing of the Twin Disc 3-stage design consists of the outer housing and two sets of stator, or reactor blades which redirect the flow of fluid between the turbine wheel stages.

The Twin Disc 3-stage design was developed primarily to give diesel engines the flexibility of steam power for many industrial applications, along with the compactness and portability of the internal combustion engine. Mainly, the characteristics sought by Twin Disc engineers were to obtain a wide range of output torque with minimum variation of engine, or input, rpm. Regardless of the load demand, the 3-stage design permits the diesel to operate within its governed rpm. range.

Because these are the principal characteristics required on heavy-duty industrial applications, the Twin Disc 3-stage torque converter is used on dieselized units in every phase of industry: in construction, petroleum, logging, mining, marine and agriculture. They may be found today on crawler tractors, power shovels, draglines, hoists, cranes, excavators, drilling rigs (including rotaries, drawworks and slush-pumps), yarders, loaders, winches, barkers and on all types of heavy-duty off-highway trucks used throughout industry. One of the earliest applications was on conversions from steam-to-diesel in the logging industry. By the late 1930s, hundreds of log loaders and yarders had been converted to diesel, applied through Twin Disc 3-stage converters to prevent lugging and stalling, load shocks, vibrations and torsional variations—and to extend the life of cables, etc., through the prevention of snapping and whipping.

Another early application was on the dieselized crawler tractor, the indispensable "heart" of so many phases of modern industry. Here, Twin Disc worked closely with Allis-Chalmers to pioneer the first standardized torque converter-equipped crawler, the HD-14-C, which first appeared in 1940. With the advent of World War II, the 3-stage design had proved itself thoroughly for tracked vehicle operation and was quickly adopted for the famous military prime movers built by Allis-Chalmers and used successfully in every theater of war.

After World War II, the powerful A-C HD-19 crawler made its appearance, with the Twin Disc torque converter as standard equipment. Later, the huge A-C HD-20 was introduced, also torque converter-equipped as standard equipment. Today, the Twin Disc converter is optional on the A-C HD-15 and is also installed on the Caterpillar D8 crawler tractor as optional equipment, with a D337 diesel engine, by Caterpillar dealers on special request from customers.

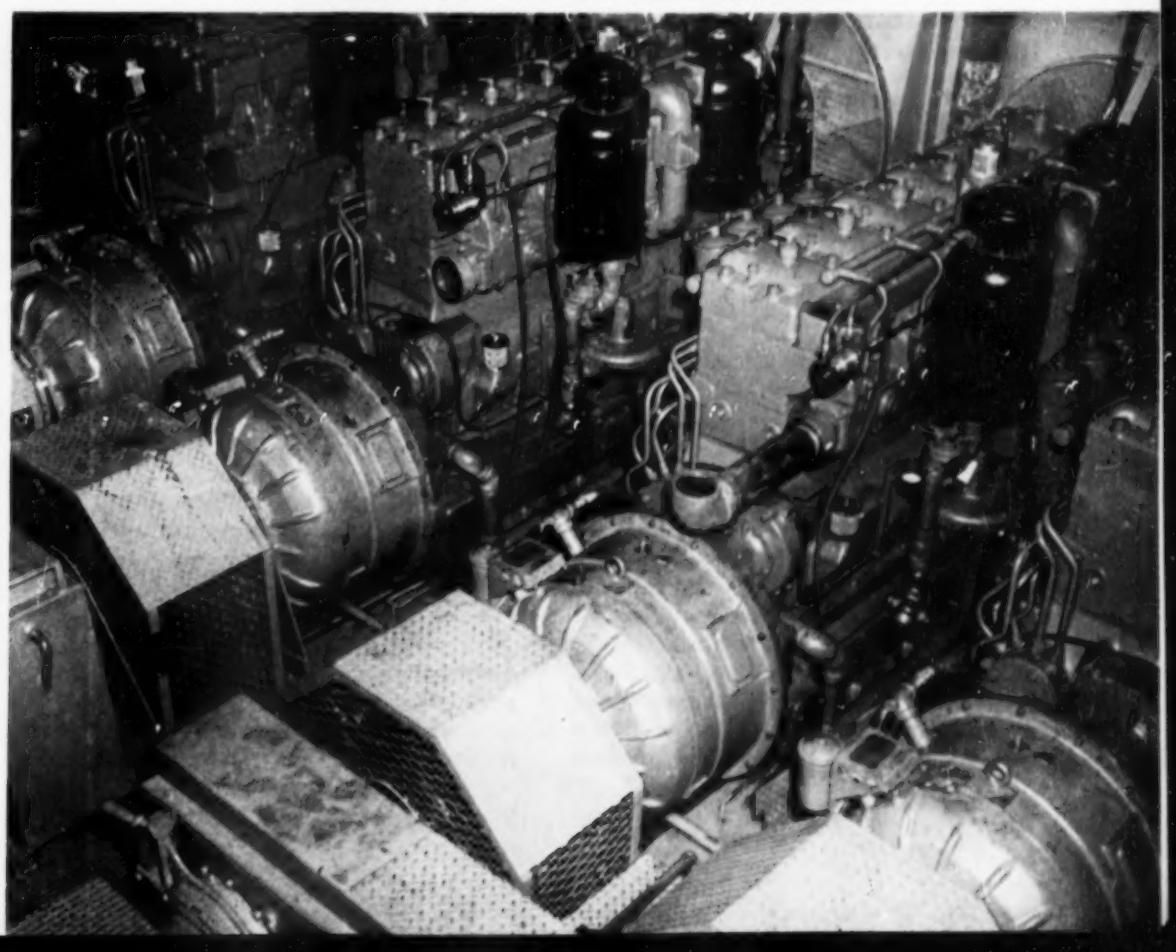
Few equipment applications are more ideal for torque converter use than the crawler tractor. With its ability to meet every load demand variation with instant and ample torque, the torque converter saves the average operator from literally hundreds of rigorous motions a day—clutching, shifting and de-clutching—and lets him crowd the load every second to utilize up to 75% of the power factor. With a multi-speed transmission, the average operator can utilize little more than 50% of the power factor on a crawler tractor because he is continually working two gears behind. Thus the torque converter provides faster work cycles per day while preventing engine lugging and eliminating the shock-loads concurrent with mechanical drive.

On powered industrial equipment used for excavating, hoisting, winching, loading, etc., the 3-stage torque converter is doing an excellent job of providing a protective cushion against the sudden shocks and strains inherent with such operations while greatly improving control of the load through the infinite ratios available within the fluid circuit. "Hovering" and "inching" of the load are made possible by eliminating the snap and jerk of mechanical connection, while the up-to-6:1 torque multiplication speeds every phase of the work cycle. In the petroleum industry, Twin Disc 3-stage torque converters are in use on both single and compound diesel installations, on large, medium and small drilling rigs. Rotaries, drawworks and slush pumps are the principal applications, but many other installations of Twin Disc converters have been made on special service pumps, cementing and acidizing pumps and sand reels.

On rotary drives, the 3-stage design permits constant crowding of the drill string. Varying torque resistance is smoothly and automatically overcome through the infinite variety of ratios within the fluid drive. Drill bit speeds can thus be matched with rock formation hardness, or to meet the exacting requirements of ticklish coring and fishing jobs. On drawworks, the 3-stage design provides the high multiplication necessary to apply high accelerating torque to the drum,

Model TL-15 Washington Trakloader works through a Twin Disc 3-stage torque converter mounted behind 200 hp. Cummins diesel.

In oilfields, drilling rig owners report cheaper, faster results with torque converters used on rotary tables, drawworks and mud pumps. These Twin Disc 3-stage torque converters are installed on a Unit rig U-30 with a Mid-Continent swinging final drive.



On crawler tractors, 3-stage torque converters provide smooth, steady application of power, better flotation, automatically match power to load demands. This Allis-Chalmers HD-20 is bulldozing for a housing addition. Twin Disc torque converters are standard on HD-20 and optional on HD-15.

at the start of the hoisting cycle, and permits uninterrupted acceleration regardless of load variations. As a result, the drilling string moves faster all the way. Also, maximum sensitivity and control is provided when pulling stuck pipe during fishing operations. On mud pumps, Twin Disc 3-stage converters are used to permit engine operation at the most efficient speed, while the pump automatically adjusts itself to maximum displacement for the pressure required. Consequently, drilling to greater depths is made possible with a minimum of liner changes.

To meet the specific requirements of a wide variety of applications, Twin Disc has developed three different models of industrial-type torque converters, with different series, or sizes: the 10,000, 11,500 and 16,000. Through internal blading variations, seven capacities are available in each size. In addition, 20 combinations of input and output ends are possible.

The Twin Disc model IF torque converter is independent-mounted with either narrow or wide chain housings provided for the input end. The model F has a flange-type input, and bolts directly to the engine flywheel housing, with no clutch. The model CF industrial-type torque converter bolts directly to the engine flywheel housing, and provides a clutch between engine flywheel and converter pump wheel. Each model offers five different output combinations: narrow-chain housing, wide-chain housing, straight shaft for direct connection to the driven load, flanged shaft for "U" joint connection to the propeller shaft and a heavy-duty direct-connected rear end.

For heavy-duty off-highway truck applications, Twin Disc has developed the models DF and CF 3-stage truck-type torque converters, each designed for distinctively different applications. Both models provide *built-in* hydrodynamic braking for smooth, powerful downhill retarding that eliminates shock loads from the engine and the driving train, and increases wear life of brakes, tires, axles, clutches, transmissions and all other drive line components. The built-in braking feature on the Twin Disc design is accomplished through use of a freewheel, which locks the driving wheels of the truck to the converter pump, or impeller, creating a powerful braking effect up to 70% of the engine's horsepower. This, when added to friction braking of the engine, virtually eliminates pedal-braking on steep downgrades.

The model DF truck-type torque converter is designed for heavy-duty hauling combining steep grades with long, flat runs and features fingertip-controlled converter drive, hydrodynamic braking and lock-out drive. The last feature also utilizes a freewheel and locks the turbine out completely, permitting straight mechanical drive as desired for maximum speed and fuel economy.

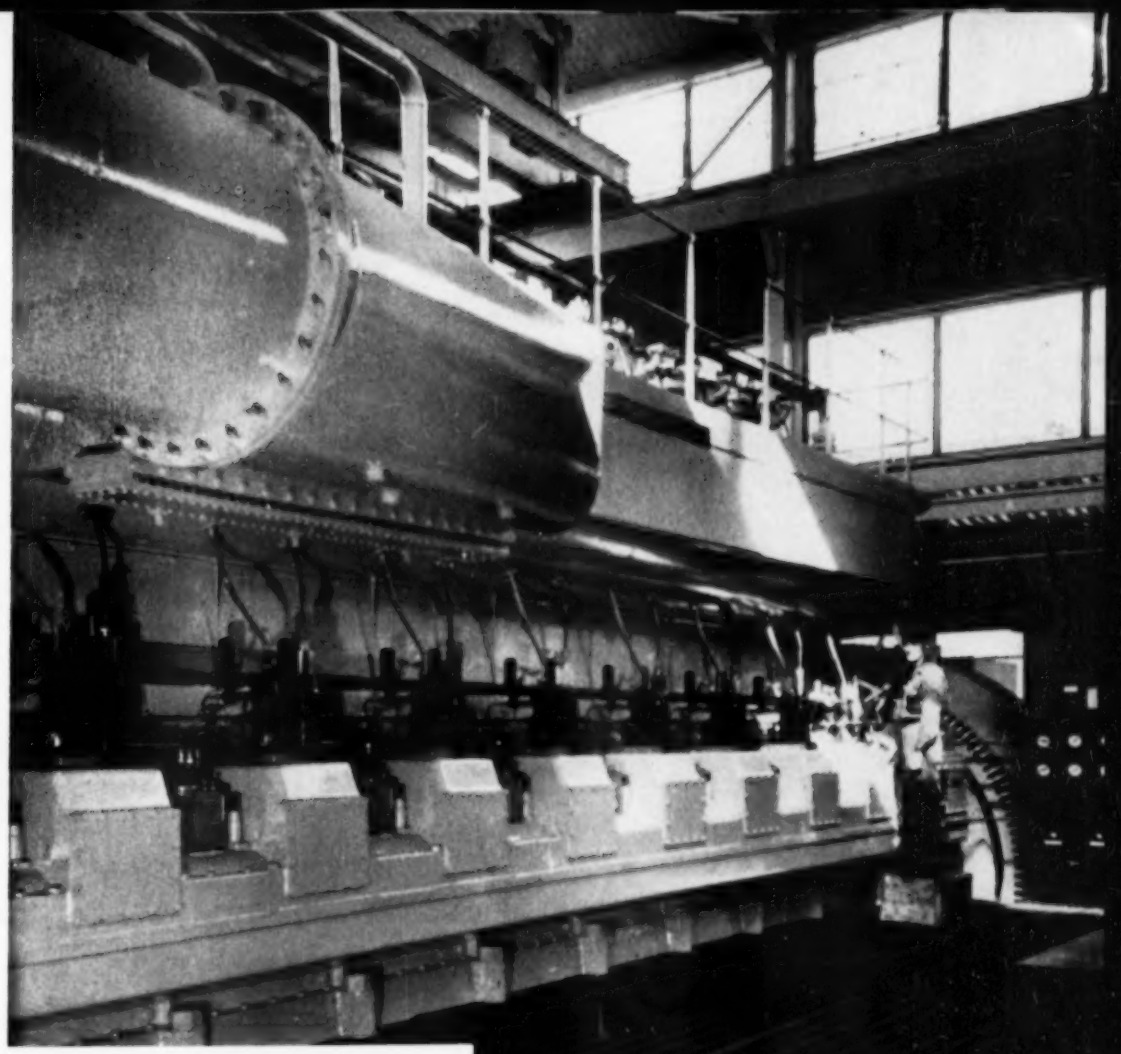
Model CF is designed for trucks on relatively short haul operations, where grades are steep and constant. Consequently, converter drive and hydrodynamic braking are both accelerator-controlled—actuated automatically when the operator pushes down or lets up on the accelerator. Lock-out drive, unnecessary on short-haul operations, is not included in this model.

At the present time, practically any industrial diesel application from 40 to 650 hp. can be provided with a torque converter from the broad Twin Disc line. The future, of course, will see the development of new designs and new concepts in dieselized industrial equipment. This will present new requirements in torque converter applications, which Twin Disc is preparing to meet with new-type torque converters already in development in its research laboratories.

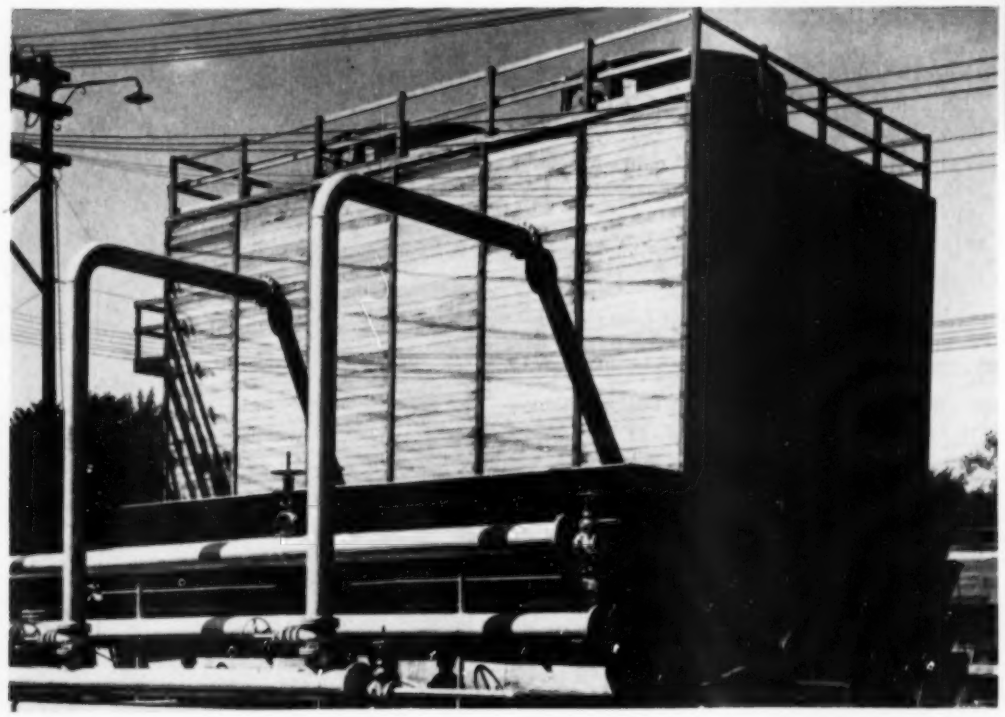
ROCHELLE, ILLINOIS

By DOUGLAS SHEARING

A COMMUNITY that combines industrial activity and substantial trade with a highly productive agricultural territory is a prosperous one. A good barometer of that prosperity is the growth in the use of electricity in the community. For example, Rochelle, Ill., during the booming 1928-29 era, generated 1,913,500 kwh. in its municipal plant during the 12-month period ending May 1, 1929. For the 12-month period ending May 1, 1953, it produced 17,220,000 kwh.—nine times as much electricity. In spite of the depression of the early thirties, the amount of electricity generated in the Rochelle municipal plant always exceeded the 1,913,500 kwh. produced in 1928-29. By 1938 the production was double this figure, and by 1943 it was four times as great. Production passed the 10 million mark in 1947-48. The peak load in 1928 was 635 kw., while today it is 4500 kw.



Duafuel controls for new 3440-hp. Nordberg engine at Rochelle are located at generator end of the unit near Nordberg gauge board. Note Manzel lubricators and Bosch fuel equipment.

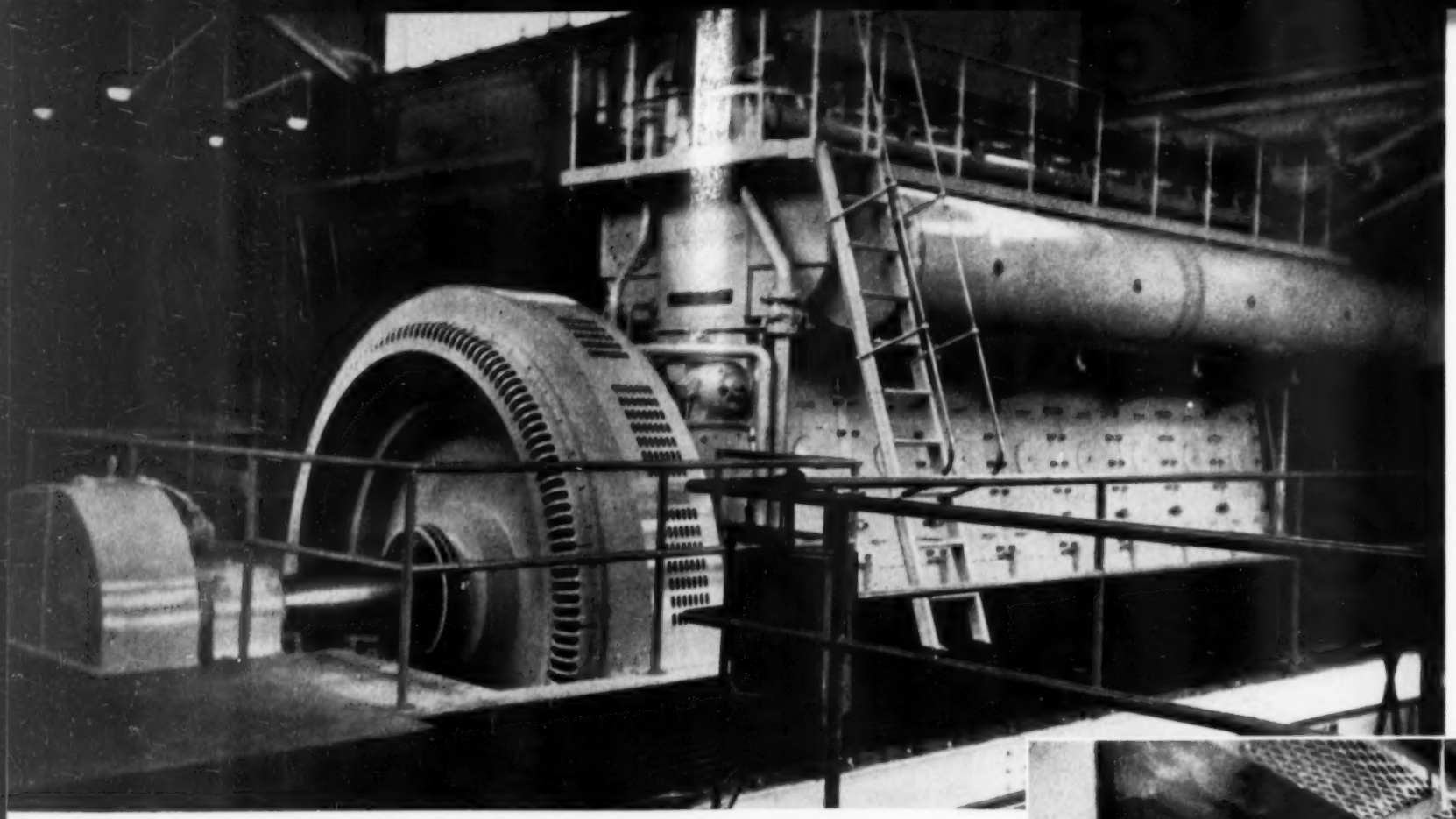


The J. F. Pritchard cooling tower at the Rochelle municipal diesel plant.

Industries contributing to this prosperity are the Austin-Western division of Baldwin-Lima-Hamilton producing street sweepers and road rollers; the Caron Spinning Co., largest processors of wool east of the Mississippi river; Morgan Dye Co. bleaching and dyeing wool; and the California Packing Corp. This last organization cans peas, beans, corn, asparagus, pumpkin, chicken and beef. A trip through the stores on Lincoln Highway street will quickly convince one that the farmer is a steady customer in the community. Furthermore, the modernization of store fronts and interiors is additional proof that Rochelle is a thriving community.

Growth in the use of electricity as experienced in Rochelle calls for frequent additions of generating capacity to meet demands. This is shown in the summary of generating equipment now installed in the plant, Table I. The municipal power plant was originally steam operated. Starting in 1920, diesels gradually replaced the steam equipment in the old power plant building. Minor modifications to the existing structure permitted the installation of additional diesel generating capacity for many years. Engineering studies of the plant made in 1940 indicated that it was rapidly approaching the day when extensive additions and modifications would be necessary to keep up with the ever-increasing electrical demand. That same year a Fairbanks-Morse 869 kw. unit was installed in space available in the waterworks portion of the building.

World War II put an end to any extensive improvement program at the power plant. It wasn't until 1946 that a 250 kw. Busch-Sulzer unit, placed in operation in 1920, was removed and a 1050 kw. Nordberg unit installed in its place. In 1948 a 376 kw. Nordberg unit that had been



Exhaust side view of Rochelle's Nordberg Duafuel engine in new power plant extension. The unit drives a 3000 kw. Westinghouse generator.

placed in operation in 1924 was replaced by a 1050 kw. Nordberg Duafuel unit. The same year a second-hand Fairbanks-Morse opposed-piston engine, originally furnished to the U. S. Navy, was purchased and installed.

With the constant load increase being experienced by the system, Fig. 1, it was realized that cooling-water facilities were inadequate and that adding more generating capacity in the existing building was out of the question. Further engineering studies in 1952 led to the preparation of plans for an extension to the existing power plant building and the installation of additional generating capacity. Construction of the addition to the building began on Jan. 15, 1953, and erection of the generating unit was started July 1, 1953. This diesel generating unit went into operation last January.

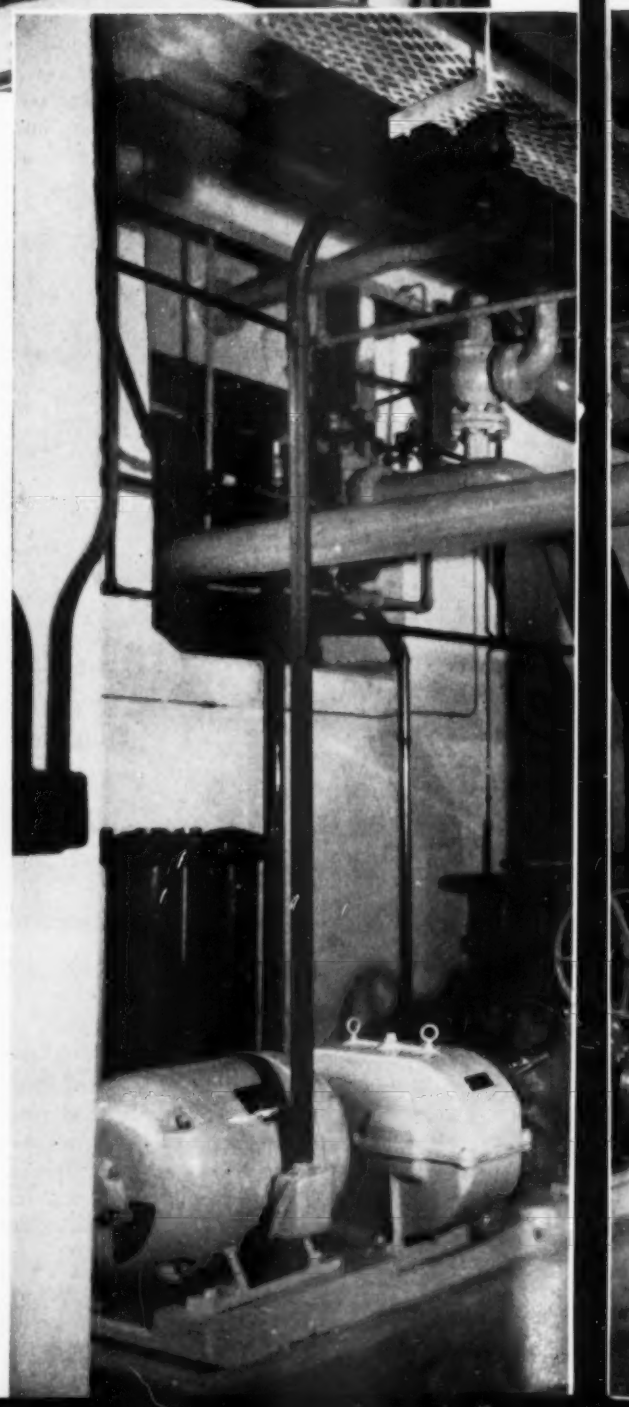
This latest addition to the generating capacity is a Nordberg 8-cylinder, 21¼ by 31, 2-cycle, low-pressure Duafuel engine rated 3440 bhp. at 225 rpm. Scavenging of the unit is handled by an Elliott motor-driven centrifugal blower with a capacity of 17,200 cfm. The engine drives a Westinghouse 3000 kw. generator and Westinghouse 40 kw., 125-volt exciter. Intake air for the unit is conditioned by an American Air Filter model CMS automatic filter located in a concrete structure on the south side of the power plant extension. Power is generated at 4160 volts by this newest Nordberg unit. General Electric metal clad switchgear has been installed for control of this 3000 kw. generator as well as the 1050 kw. Nordberg Duafuel unit installed in 1949. A tie breaker is provided for a 3750 kva. transformer connecting the existing 2300-volt station bus to the new 4160-volt bus, together with breakers for the control of three 4160-volt distribution circuits. Extensive revisions of electrical facilities throughout the plant were necessary in this modernization program.

Table I
Existing Generating Equipment

Year Installed	Capacity	Type	Manufacturer
1929	600 kw.	Diesel	Worthington
1936	800 kw.	Diesel	Nordberg
1940	869 kw.	Diesel	Fairbanks-Morse
1946	1050 kw.	Diesel	Nordberg
1949	1050 kw.	Duafuel	Nordberg
1949	1000 kw.	Diesel	Fairbanks-Morse*
1954	3000 kw.	Duafuel	Nordberg

*Engine built for Navy in 1944 and purchased second-hand in 1949.

The cooling water system has been completely reconstructed as a part of this modernization program. This included the installation of an induced-draft type spray-coil tower supplied by J. F. Pritchard and Co., new raw and jacket-water pumping facilities and new jacket and raw-water headers. These headers are run above ground between the cooling tower and the pump bay in the east end of the power plant building. Jacket-water headers inside the building are supported along the engine-room wall above the engines at the engine end of the units. Connections from headers to engines are extremely short due to the header location. All piping in the new addition to the power plant is color coded for safety and for ease of identification. Paint colors



used on equipment and structures were selected to harmonize yet aid visibility in the plant.

The building addition for housing the new Nordberg unit is 50 by 83 ft. in plan with a 50-ft. crane span and crane rails located 25 ft. above the operating floor. A full basement in this addition, 12 ft. deep, houses fuel and lubricating-oil auxiliaries, starting-air tank and compressor, station batteries and station power transformers. Sufficient space is available for the installation of another unit as large as the 3000 kw. unit just placed in operation. The scavenging blower is located on the operating floor at the engine end of the unit. A combination rubber and cork sandwich is used to isolate blower and driving-motor vibrations from the building. Rubber expansion joints in both the blower air intake and discharge lines serve to eliminate vibrations.

Gas fuel for the plant is purchased under contract from the Allied Gas Co. at a price of 40 cents per million Btu. Pilot fuel is a No. 2 refined product obtained from the Standard Oil Co. terminal station in Rochelle and costs 10.67 cents per gallon delivered. Fuel for the operation of the oil-burning diesels is a straight Texas crude, 22 API gravity, and costs 10.93 cents per gallon delivered. All storage tanks containing crude oil are provided with hot-water coils for heating. Heating coils in exhaust mufflers provide the necessary hot water for this purpose.

The municipal electric utility in Rochelle is one of the community's biggest business enterprises. Under the direction of Superintendent Lyle Brady, it is serving the city's electrical needs successfully and at a profit. It wouldn't be able to contribute $48,000 a year toward the operation of general city activities if it weren't a profitable business for the citizens of Rochelle.

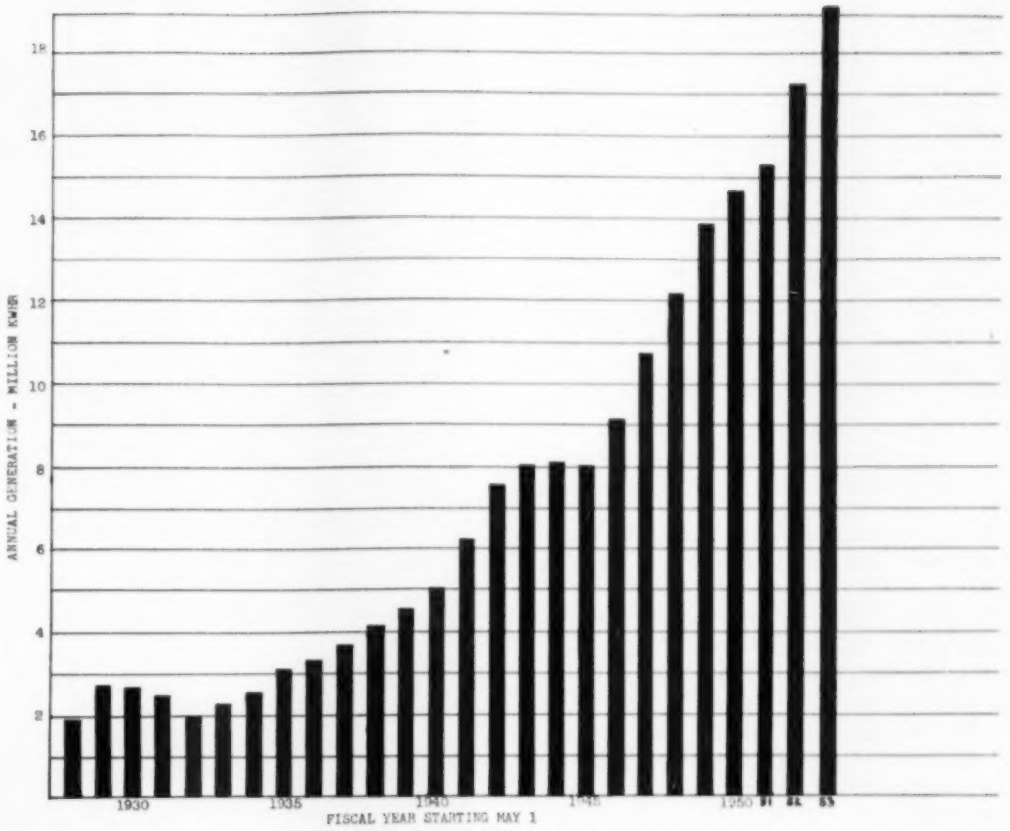
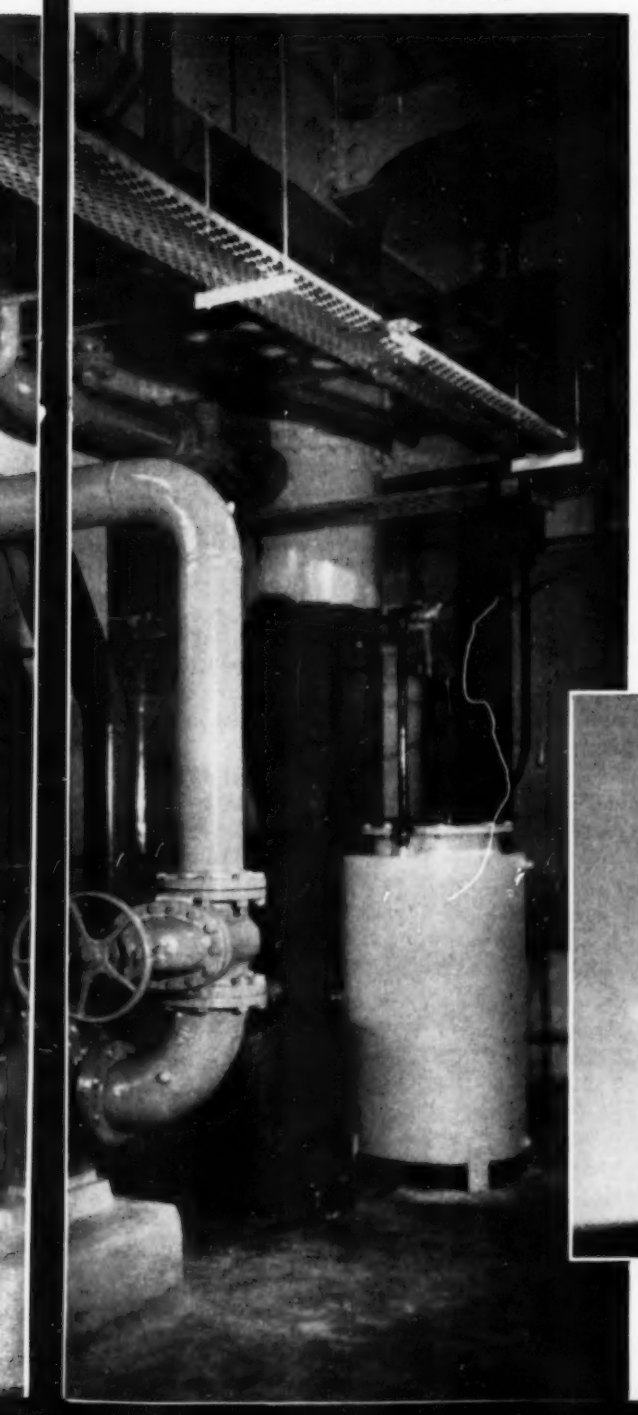


Fig. 1—Growth of load at Rochelle, Ill.

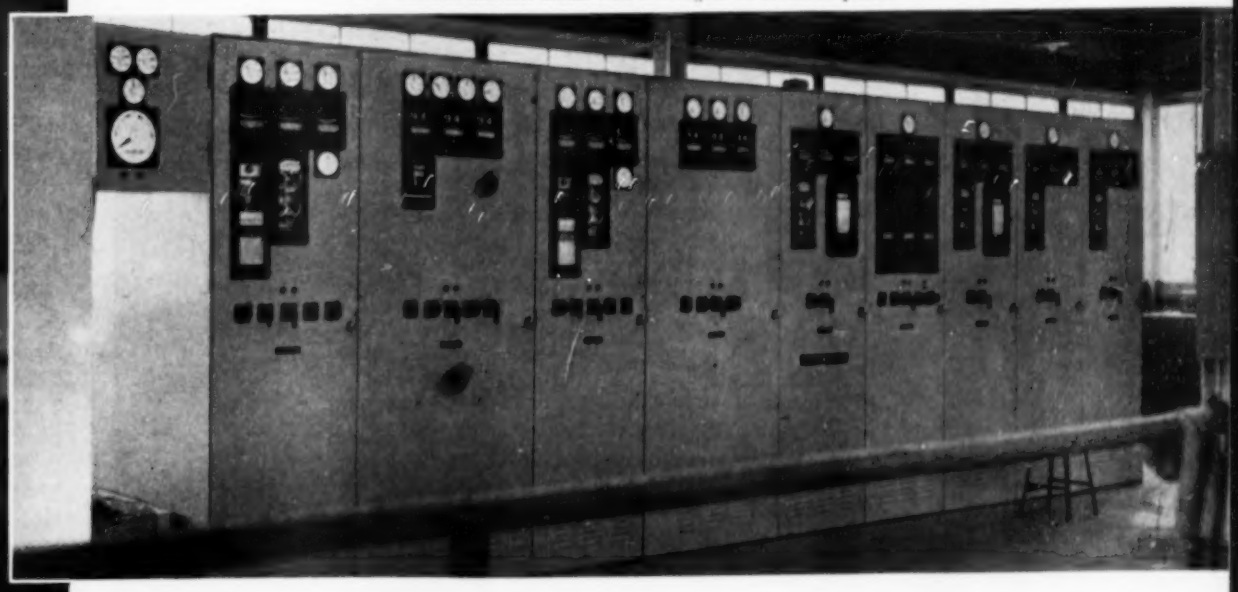
List of Equipment

Engine—3440 hp., 2-cycle, 8-cylinder Duafuel Nordberg.
Alternator—Westinghouse.
Exciter—Westinghouse.
Scavenging blower—Elliott.
Exhaust muffler—Burgess-Manning.
Intake air filter—American Air Filter.
Lubricating oil cooler—Ross.
Emergency lubricating oil pump—Blackmer.
Lubricating oil purifier—Honan Crane.
Fuel oil filters—Nugent and Hoffman.
Fuel oil pumps—Haight and Viking.
Starting air compressor—Gardner-Denver.
Centrifuges—DeLaval.
Cooling tower—J. F. Pritchard.
Switchgear—General Electric.
Consulting Engineer—Stanley Engineering Co.

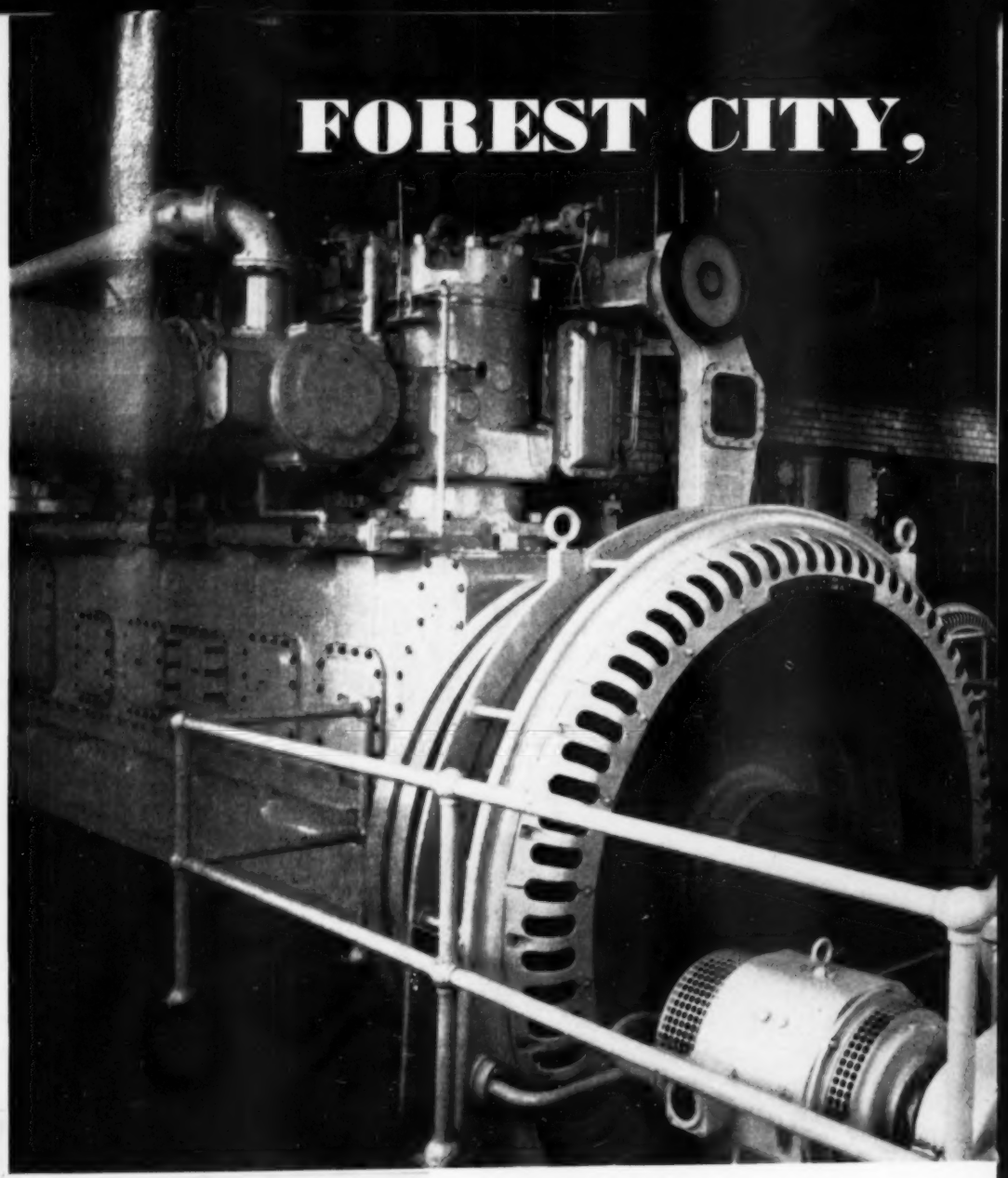
Auxiliary grouping shows Blackmer emergency lube oil pump, Nugent fuel oil filters, Ross lube oil cooler and Nordberg magnetic oil separator, all serving the new Duafuel engine.



New General Electric metal clad switchgear at Rochelle plant.



FOREST CITY,



Interior of Forest City plant. At left, the 1000-hp. Fairbanks-Morse dual-fuel engine, direct-connected to 875 kva., 700 kw., 3-phase, 60-cycle, 2400-volt F-M alternator. Other four engines are Busch-Sulzer, equipped with Electric Machinery alternators.

INSTALLING a new 1000-hp. Fairbanks-Morse dual-fuel engine and switching the bulk of its operations over to natural gas have enabled the municipal power plant at Forest City, Iowa, to cut fuel costs more than 35% since mid-1950 and reduced total plant production expenses more than 27%. As a result of these savings, the plant has been able to pay off a revenue bond issue of $150,000 in just 3½ years. The bond issue was used to finance an improvement and expansion program completed in June, 1950, with the addition of the Fairbanks-Morse engine and the construction of a new wing on the power house building. This raised the number of prime movers in operation to five, increased the plant's generating capacity to 1865 kw. and re-established a firm capacity in excess of peak load.

Since going into service more than three years ago, the model 33FD16 Fairbanks-Morse diesel has been the most economical engine in the Forest City plant. In the 29-month period between June, 1950, and October, 1953, it was in operation for a total of 14,350 hours, generating 7,336,260 kwh. at an average fuel cost of 3.89 mills per kwh. (just half the plant's previous cost), based on a prevailing gas price of 26 cents per thousand cubic feet and an oil price of 11 cents per gallon. At the same time the plant's second gas-burning engine, a Busch-Sulzer diesel converted to dual-fuel in May, 1951, delivered power at the rate of 5.62 mills per kwh., or 25.6% below the 7.77 mills per kwh. reported for fiscal 1949-1950, the last complete 12-month

Wing on left of attractive Forest City, Iowa, plant was built in 1950 to house 1000-hp., model 33FD16 Fairbanks-Morse dual-fuel engine.

period before the F-M engine was installed. (See Table I.) Meanwhile, total plant production costs (before interest and depreciation) dropped from 13.7 mills per kwh. in 1949-1950 to 9.8 mills during the first 10 months of 1953. This was achieved in the face of rising wages, fuel prices and other expenses and is directly attributable to the low cost of dual-fuel operation.

Forest City is located in a rich agricultural region in north-central Iowa, just below the Minnesota border, serving as a trading center and county seat for Winnebago county. Almost exclusively a residential community, it has a permanent population of 2766 and a student population of about 380 attending Waldorf College. The only industrial power users are two locker plants, a canning factory and a large feed mill.

The town council first established a municipal light and power utility in June, 1939, constructing an attractive brick and stone power house

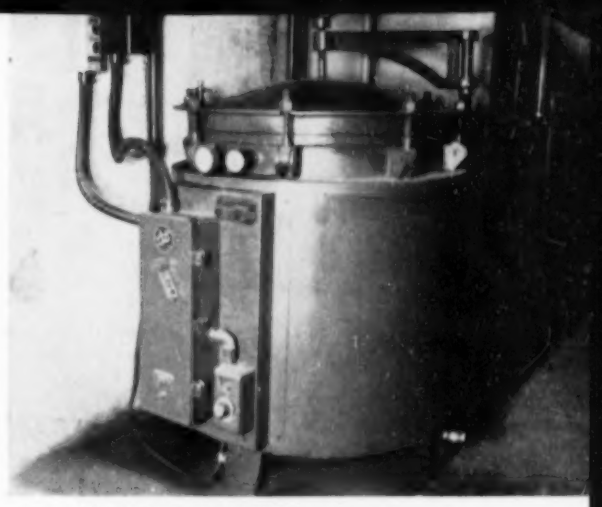
and installing three Busch-Sulzer diesel engines of 225 hp., 300 hp. and 375 hp. With these engines delivering a total of 600 kw., the plant increased its annual production volume from 1,149,490 kwh. in fiscal 1940-1941 to 1,762,610 kwh. in 1945-1946, making it necessary to install a fourth Busch-Sulzer engine to handle the demand. The addition of this larger engine, rated at 825 hp., raised the plant's generating capacity to a new high of 1165 kw.

However, in the next four years, the plant's annual output spurted more than 73%, reaching 3,059,720 kwh. in fiscal 1949-1950. To meet this increased demand and to reinstate a firm capacity in excess of peak load (about 1100 kw. at that time) the city undertook an extensive improvement and expansion program in 1950. A revenue bond issue of $150,000 was floated, a new addition to the plant building constructed and a new 1000-hp., 700-kw. Fairbanks-Morse dual-fuel engine installed. All work was completed and the F-M engine placed on the line by June, 1950. This was the first opportunity the plant had to take advantage of low-cost natural gas, and the effect on the plant's operating economy was immediate and striking. To take even further advantage of the savings possible, the 825-hp. Busch-Sulzer engine was converted to gas in May, 1951.

The Forest City electric system has been consistently profitable and fuel savings since installation of the F-M unit have more than balanced other rising costs. From April 1, 1950, through October 31, 1953, the department earned a net profit (before depreciation) of $159,383.04. Deducting the allowance for depreciation, clear net profit was an impressive $112,712.29. In the first 10 months of 1953, profits before interest and depreciation had already reached $44,263.71. With a final payment of $80,000 in September, 1953, the last of the original revenue bonds, issued less than 3½ years before, was called in and the plant declared wholly free of debt. In addition to this, funds were available for a new mercury vapor whiteway constructed along the town's main street, paid for by plant profits.

In its 14,281 hours of operation, not a single repair or part replacement was made on the Fairbanks-Morse engine. The same rings, bearings and other parts are in service today that were in service in 1950. A piston pulled in 1952 was found in such excellent condition that its machine markings were still visible even after two years of service. At first the ports of this heavy-duty engine were checked weekly, but when they were still found in perfect condition after a year of continuous checking, the plant superintendent eliminated the weekly inspection. The 33FD16 F-M dual-fuel engine is rated at 1000 hp., has five cylinders of 16-in. bore and 20-in. stroke, and drives a 700-kw., 875-kva., 3-phase, 60-cycle, 2400-volt alternator at a speed of 300 rpm. The 15-kw. exciter is chain-driven. Ordinarily the F-M engine is run during the heavy-load period from 8 a.m. to 10 p.m., with the large Busch-Sulzer unit taking over during the last evening and morning hours and all day Sunday. The three small diesel engines are now used only for peaking.

Gas, with a heat value of 910 Btu. per cubic foot, arrives at the plant at a pressure of from 15 to 30 lbs. It passes through a recording meter to a motor-driven gas compressor, which raises its pressure to 30 psi., and then goes to the Fairbanks-Morse engine through a regulator at 20 psi. For use in the Busch-Sulzer unit, the gas pressure is reduced to 3½ psi. before entering the injection system. Both dual-fuel engines are generally started on oil before being switched to gas operation. Fuel oil arrives at the plant by railroad tank car and is unloaded into three 12,000-gallon storage tanks by a motor-driven transfer pump. It then goes through a cellulose-packed purifier and a recording meter to five elevated day tanks, the tank for the F-M engine having a capacity of 250 gallons. Before reaching the injection pumps on the F-M engine, the fuel oil flows by gravity to the engine supply pump, then goes through a duplex pressure filter.

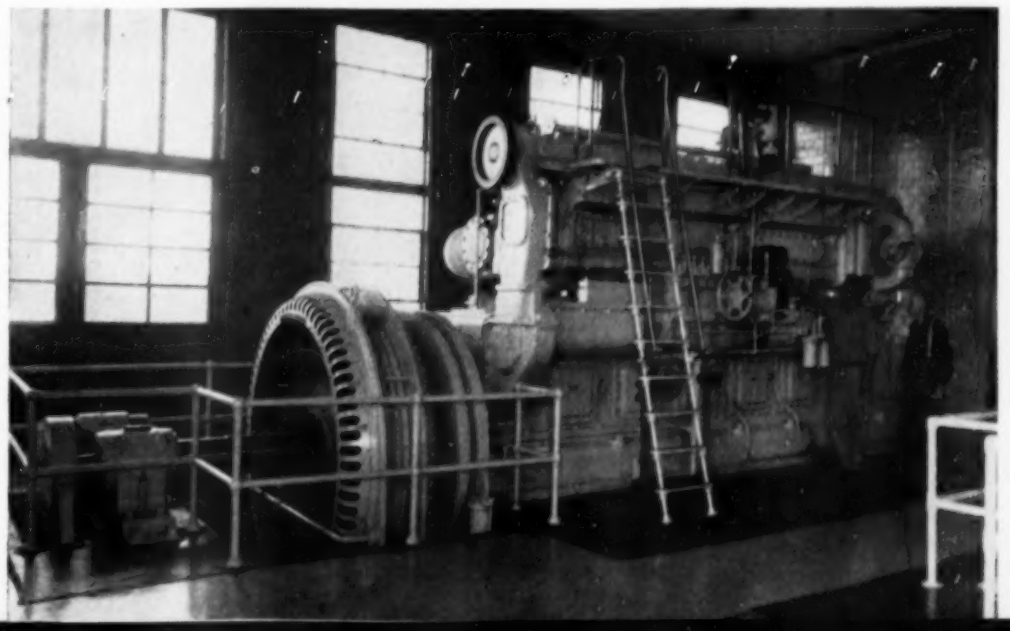


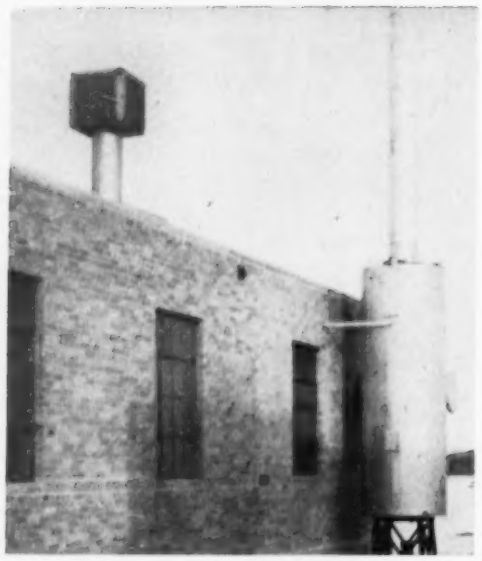
This Hoffman lube oil filter serves the F-M engine. It is equipped with a motor-driven pump which picks up lube from crankcase and circulates it through cellulose cartridges and back to the crankcase.

As indicated by the remarkably small wear on cylinders, rings and bearings, lubrication has been excellent, yet lube consumption has been low. In 14,281¼ hours of operation, the F-M engine used only 2402 gallons of lube oil, an average of 5945 rated horsepower-hours per gallon. A high-detergent type lube oil is used and is pumped under pressure to all cylinders, pins and bearing surfaces, cooled in an oil cooler and kept free of carbon and other impurities by a cellulose-packed filter.

The oil runs so clean that more than a year went by before the first filter cartridge was changed, and even then it was not absolutely necessary. Experience at the plant indicates that the aver-

Howard Nessa, superintendent of Forest City Light Department, adjusts Woodward governor on F-M dual-fuel engine. The 1000-hp. engine has helped cut plant fuel costs more than 35% since being installed.





Exhaust gases from F-M engine are expelled through this Maxim silencer. On the roof is the engine's 4-element Air-Maze air filter.

Jacket water for all five engines is cooled in 2-fan, forced-draft Diesel Service Co. cooling tower.

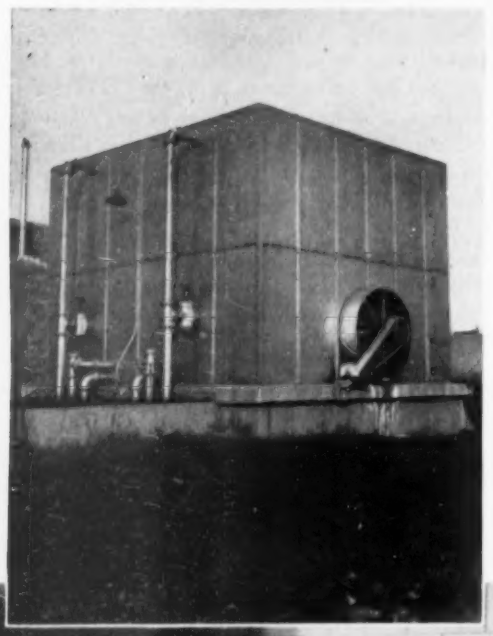


Table I
Fuel Costs, Forest City, Iowa

	Kilowatt-hours Generated	Total Fuel Cost	Fuel Cost Mills/Kwh.
Plant (diesel) 1949-1950	3,059,720	$23,789.72	7.77
Plant (D-F & Diesel) 6/50-10/53	12,219,890	61,272.23	5.01
F-M Dual Fuel 6/50-10/53	7,336,260	28,561.00	3.89
B-S Dual-Fuel 5/51-10/53	3,295,728	18,549.50	5.62
Diesels 6/50-10/53	1,587,902	14,161.73	8.92

age life of each filter cartridge on the Fairbanks-Morse engine is 5000 hours.

Four jacket water pumps, including two standbys, supply cooling water for the entire plant, circulating it through coils in a 2-fan, forced-draft cooling tower. Raw water is sprayed in a fine mist over these coils by three spray pumps, also including two standbys.

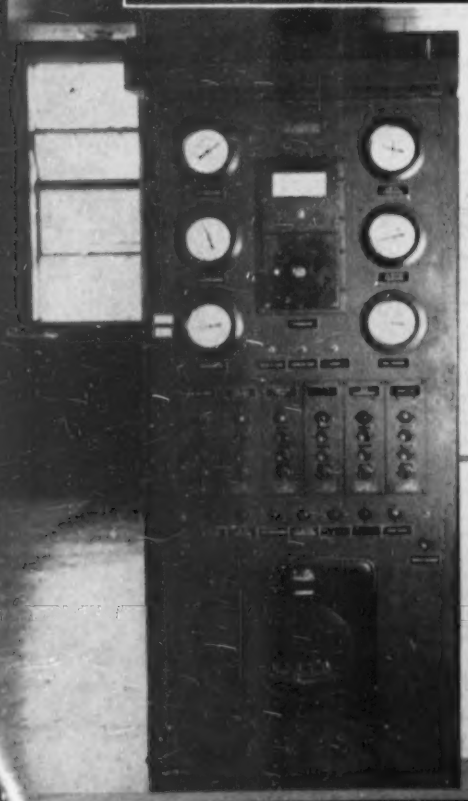
The F-M engine's well-equipped gauge board includes an exhaust pyrometer, alarms and gauges on all pertinent pressures and temperatures, push-button controls for the auxiliary lube pump and lube purifier pump, gas compressor and ventilating fan. It also includes pressure gauges on gas going to and from the compressor.

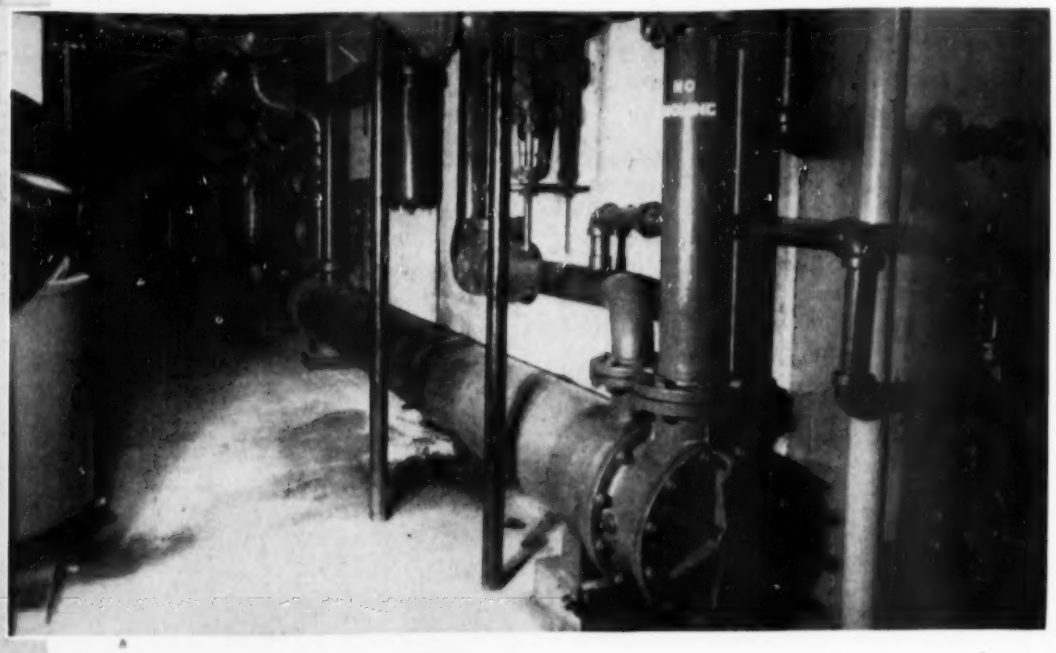
The Forest City municipal power plant is a typically prosperous public utility, returning handsome dividends to the city treasury in the form of continuously increasing profits and providing its citizen-owners with dependable, low-cost electric energy. Thanks to the efficiency of the plant, electric rates have never risen above their prewar level, despite increases in fuel prices, wages and other operating expenses. The Fairbanks-Morse engine installed nearly four years ago has played a large part in making this low-rate schedule possible. Ultimate responsibility for the success of the plant rests with Mayor Roy Shram of Forest City and with the following members of the town council: Earl Anderson, Edward Christ, H. E. Cribbs, W. B. Hibbs, Merle Hill and Carl Sunde. Immediate responsibility for the plant's operating efficiency and economy rests with Howard Nessa, superintendent of light and power for Forest City.

List of Equipment

Engine—Model 33FD16, 1000-hp., 300 rpm., 5-cylinder, 16 by 20 in., dual fuel, Fairbanks-Morse.
Alternator—Type TGZO, 875 kva., 700 kw., 3-phase, 60-cycle, 2400-volt, Fairbanks-Morse.
Exciter chain drive—Link Belt.
Governor—Woodward.
Gas meters—American Meter.
Gas compressor—Allis-Chalmers.
Fuel oil purifier—Honan-Crane.
Fuel oil meter—Rockwell.
Fuel oil duplex filters—Nugent.
Lube oil filter—U.S. Hoffman.
Lube oil cooler—Ross.
Before-and-after lube pump—Roper.
Forced-draft cooling tower—Diesel Service.
Water softener—General Filter.
Spray water pumps—Peerless.
Jacket water pumps—Weinman.
Thermostatic control valve—Fulton Sylphon.
Air filter—Air-Maze.
Exhaust silencer—Maxim.
Gauge board—Omaha Electrical Works.
Exhaust pyrometer—Alnor.
Gauges—Marshalltown.
Gas compressor gauges—Foxboro.
Fuel oil—Standard Oil (Ind.).
Lube oil—Standard HD, Standard Oil (Ind.).

Omaha Electrical Works gauge board is equipped with Alnor pyrometer, Marshalltown and Foxboro gauges and a full set of alarms and push-button controls.





Lube oil on F-M dual-fuel engine is cooled in this Ross lube cooler. Also seen is the engine's full-flow strainer.

This 50-ft. Pacific Fruit Express mechanical refrigerator car is equipped with a Frigidaire unit and GM diesel. Workmen (at left) are shown loading a mechanical "reefer."

CROSS-COUNTRY REFRIGERATOR

By F. HAL HIGGINS

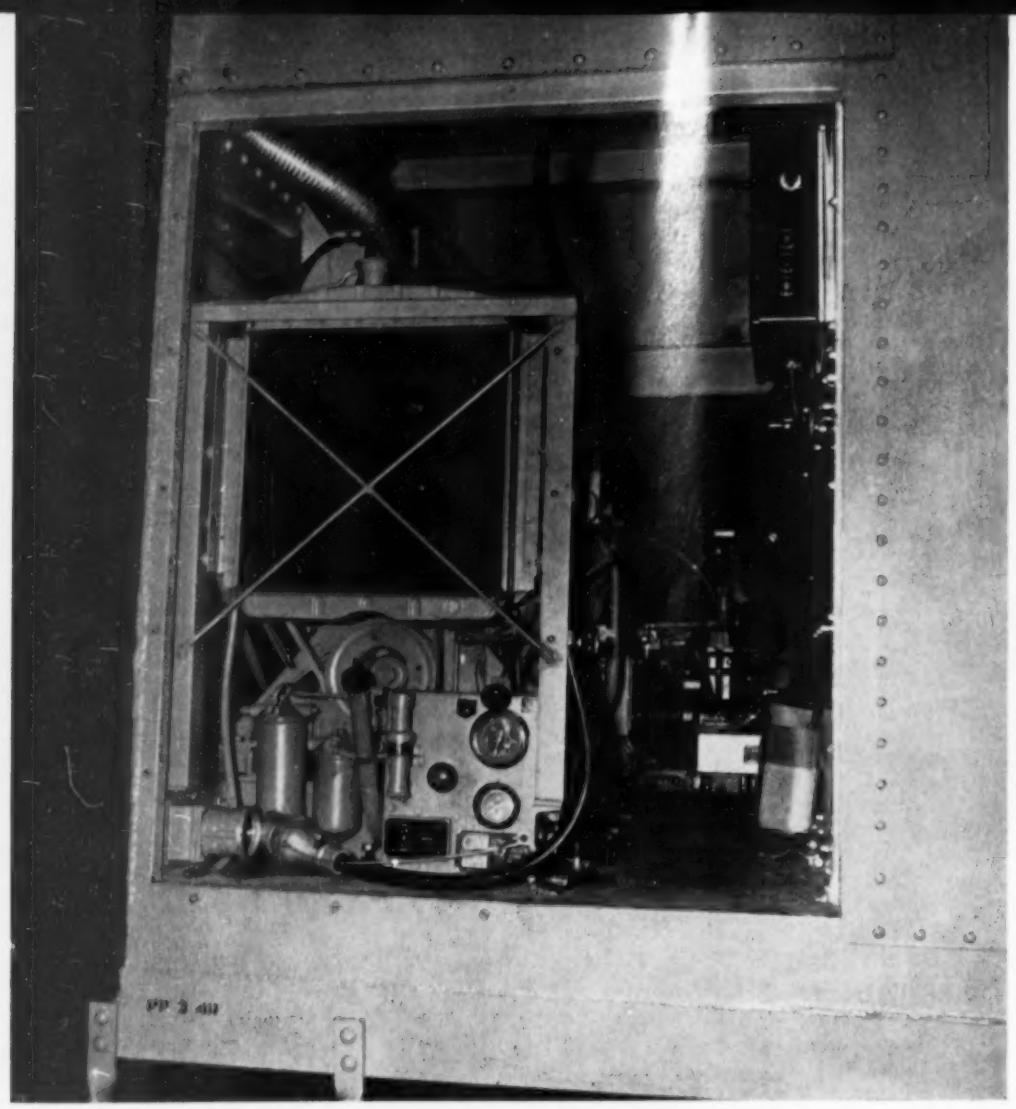
RAIL transportation is the key to California's rapid rise to No. 1 farm state with the commercial production, processing, packing and marketing of more than 200 food crops. Before the golden spike of 1869 connected California with eastern markets, grain and hides were practically its only export crops—and they went by ship around the Horn, weeks or months from their markets. The Gold Rush tempo that sent daring young men in quest of fortune and home is present today in agriculture and the industries and services it sustains and of which it demands the mass production of quality foods. By 1875 the bonanza wheat farmers of the Sacramento and San Joaquin valleys, through mechanization and sound management methods, had compelled Russia, Australia and other grain-exporting nations to recognize their world leadership.

This background is given merely as a starting point for the "double dieselization" of railway equipment that has come about to meet the need for increased mass production of quality foods for the markets California farmers choose for their many special crops.

The grower continues to produce and market his crops to hit the best market for each. In tracing the history of California agriculture, we can see how various crops have been lifted—through the cooperative efforts of growers, processors, packers, bankers and railroads—to prosperity by reaching top quality markets: 1) Oranges began rolling in "Cannonball Orange Special" trains in 1886 to beat passenger time from Southern California to Chicago. 2) Green crops of fruit—peaches, plums, pears, grapes, etc.—from Sacramento, about 1884. 3) Eggs, asparagus, lettuce, carrots, raisins, prunes and canned fruits followed. Raisins and prunes had to displace imports on the big markets to win their position. 4) In the post-World War II era the consumer demands frozen foods, so strawberries and lemon concentrates require a new railway service to haul them at below-zero temperatures.

Pacific Fruit Express, a subsidiary of the Southern Pacific and Union Pacific railway system, has just completed the building of 125 diesel-electric mechanical refrigerator cars at its Roseville, Calif., plant. The writer visited the Roseville shops to look over the cars built last year and the new ones under construction earlier this year. He had stopped off at Yuma, Ariz., to find the lemon farming industry booming in an effort to meet the demand for frozen lemonade or lemon concentrates. Some big growers were moving over from California for cheaper land, more room and fewer bugs to fight, and had solved the Arizona frost hazard by installing wind machines as part of their operations.

A call on General Superintendent G. P. Tor-



Closeup of Frigidaire-GM diesel installation in a PFE refrigerator car.

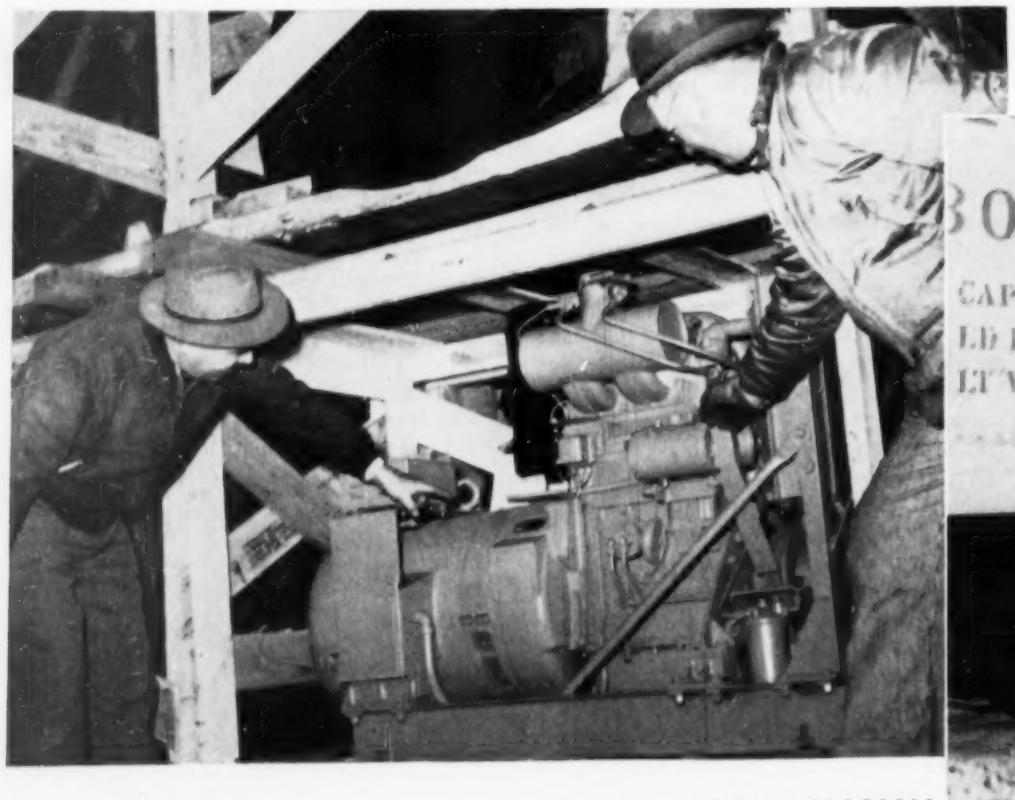
burn of the Pacific Fruit Express car department at his San Francisco office provided details on the diesel-electric installations. They give the railroad service for California frozen foods a "double diesel" ride—big diesel locomotives and switch engines rolling the cars and the refrigerating units insuring quality. Mr. Torburn and his staff of engineers offered these facts on the engineering of the diesel-electric cars:

Ice as a railroad refrigerant has stood the test of time. It continues to be the simplest and most economical dependable source of refrigeration energy for the general run of perishable products transported by rail. In the late twenties quick-frozen foods came into the picture; that brought efforts to develop mechanical refrigeration. The frozen food business dates from 1923 when Clarence Birdseye began quick-freezing seafoods. The idea was slow in catching on until applied to fruits and vegetables (shipments rose from 10,000 cars in 1945 to 34,000 cars in 1952). Development of the frozen juice industry called for zero temperatures and renewed interest in perfecting mechanical refrigeration.

PFE's entrance into mechanical refrigeration involved 25 units installed in heavily insulated 50-ft. cars. Frigidaire division of General Motors built the mechanical units for 14 of these first refrigerated "reefers." The Trane Co. of La Crosse, Wis., built the other 11 units. The Frigidaire units consist of a 2-cylinder, 2-cycle, 34 hp. GM diesel engine direct-coupled to a 20 kw., 220-volt alternator supplying electric power for two 5 hp. compressor motors, a 1 hp. fan motor and a 1½ hp. blower motor. Compressors are of the 2-cylinder, upright type, running at 1750 rpm., direct-driven. The cooling coil on the original Frigidaire unit is compact—14 in. deep by 60 in. wide by 12 in. high—and consists of ¾-in. copper tubing, fins spaced four per inch.

The PFE engineering staff proposed the experimental installation of a large cooling, or evaporator, coil in the 11 cars to be equipped with Trane units. In most other respects these cars follow the design of the other 14. The Trane coil occupies the area of an entire end wall and con-

Shop men inspect a crated GM diesel engine awaiting installation at Pacific Fruit Express shops at Roseville, Calif.



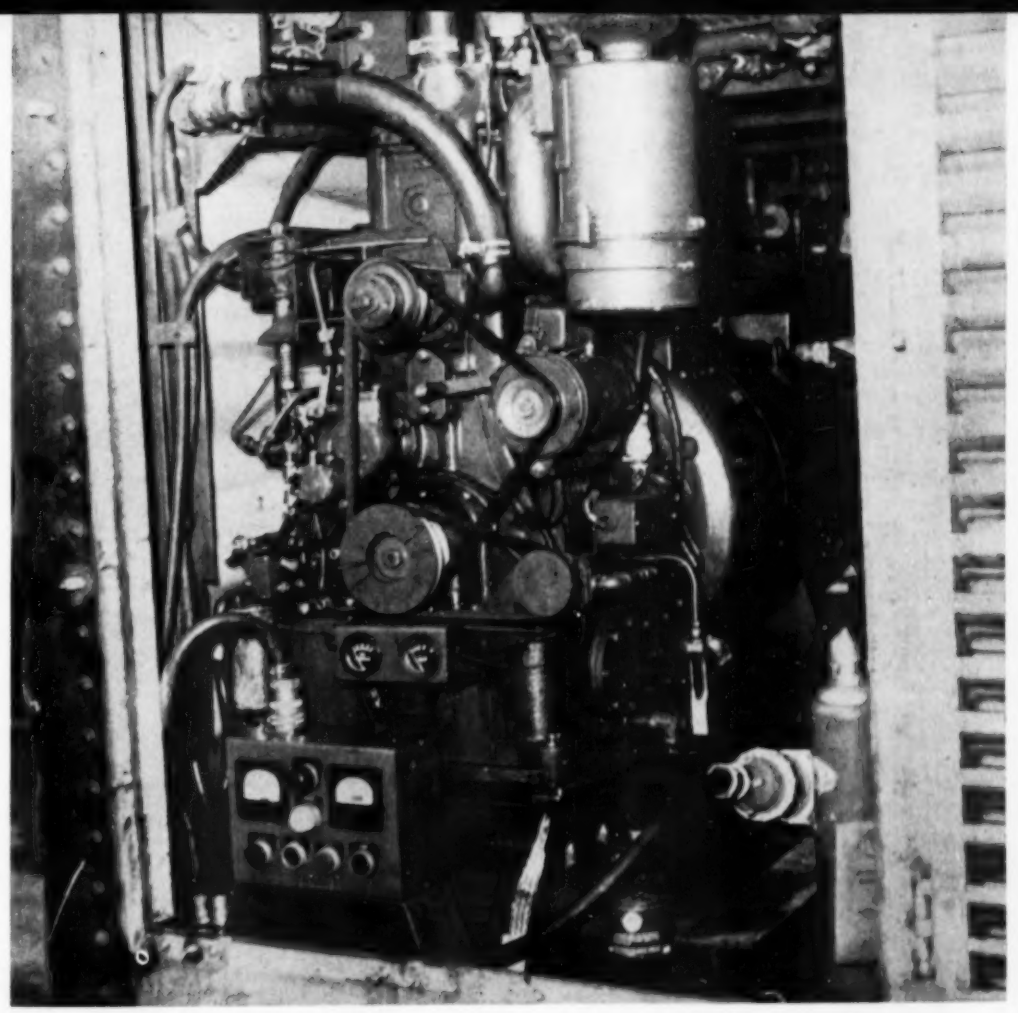
A Union Oil Co. driver pumps diesel fuel into a PFE mechanized "reefer." Each tank holds up to 375 gallons of diesel fuel.

sists of ¾-in. OD copper tubes with aluminum fins spaced an inch apart. Its surface is about 1150 sq. ft. These cooling coils are located in the end air space of an envelope surrounding the load. It was expected that by preventing the free mingling of refrigerated air with that in the loading compartment that the air envelope would reduce the accumulation of frost to the point where the wide fin spacing of the coil would accept the frost produced during the entire trip without serious detriment to the air circulation and cooling process, obviating the need of heater equipment for periodic defrosting.

These cars all have 10½ in. insulation in ceiling, 6 in. in walls and 7 in. in floors. This design provides an envelope of cold air completely surrounding the load, accomplished by spacing a plywood lining away from the insulated walls and creating an air flue which joins similar air spaces over the metallic ceiling and under the floor. This flue confines the refrigerated air circulation and eliminates the blast of freezing air, which would hamper loading and unloading.

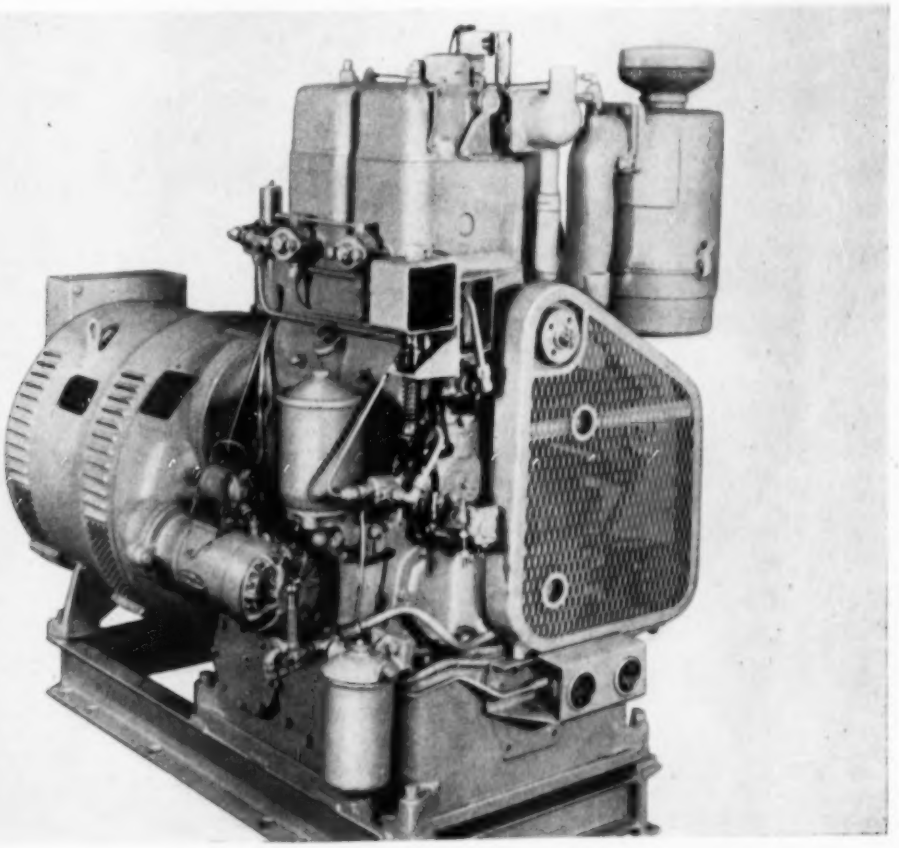
PFE has recently completed at Roseville 100 additional mechanical refrigerator cars of the same general inside dimensions: 44 ft., 6 in. long; 8 ft., 6 in. wide; 7 ft., 3 in. high; with a total capacity of 2742 cu. ft. and a loading capacity of 130,000 lbs. These are equipped with an improved Frigidaire unit with the GM diesel. Experience with the original large cooling coil demonstrated the value of a greater cooling surface and fin spacing. The new coils have a surface of 728 sq. ft. The automatic defrosting feature will be retained, but it is anticipated that this operation will be restricted to one-day intervals instead of every eight hours as prevails with the original Frigidaire equipment.

This is the third of a series of articles dealing with the creating of a market for 130,000 diesel engines to modernize the nation's existing fleet of reefers. The first article appeared in the November, 1953, issue and described the Santa Fe Railway's Mechanical Temperature Control (MTC) refrigerator car. The second story appeared in the August, 1954, issue of DIESEL PROGRESS. Another story is planned for an early issue. It will tell of the successful conversion of reefers by one of the outstanding eastern fruit express companies.



A Trane Co. unit powered by a Nordberg generator set. The Trane-Nordberg combination was used in 11 of the first 25 cars which marked PFE's entrance into mechanical refrigeration.

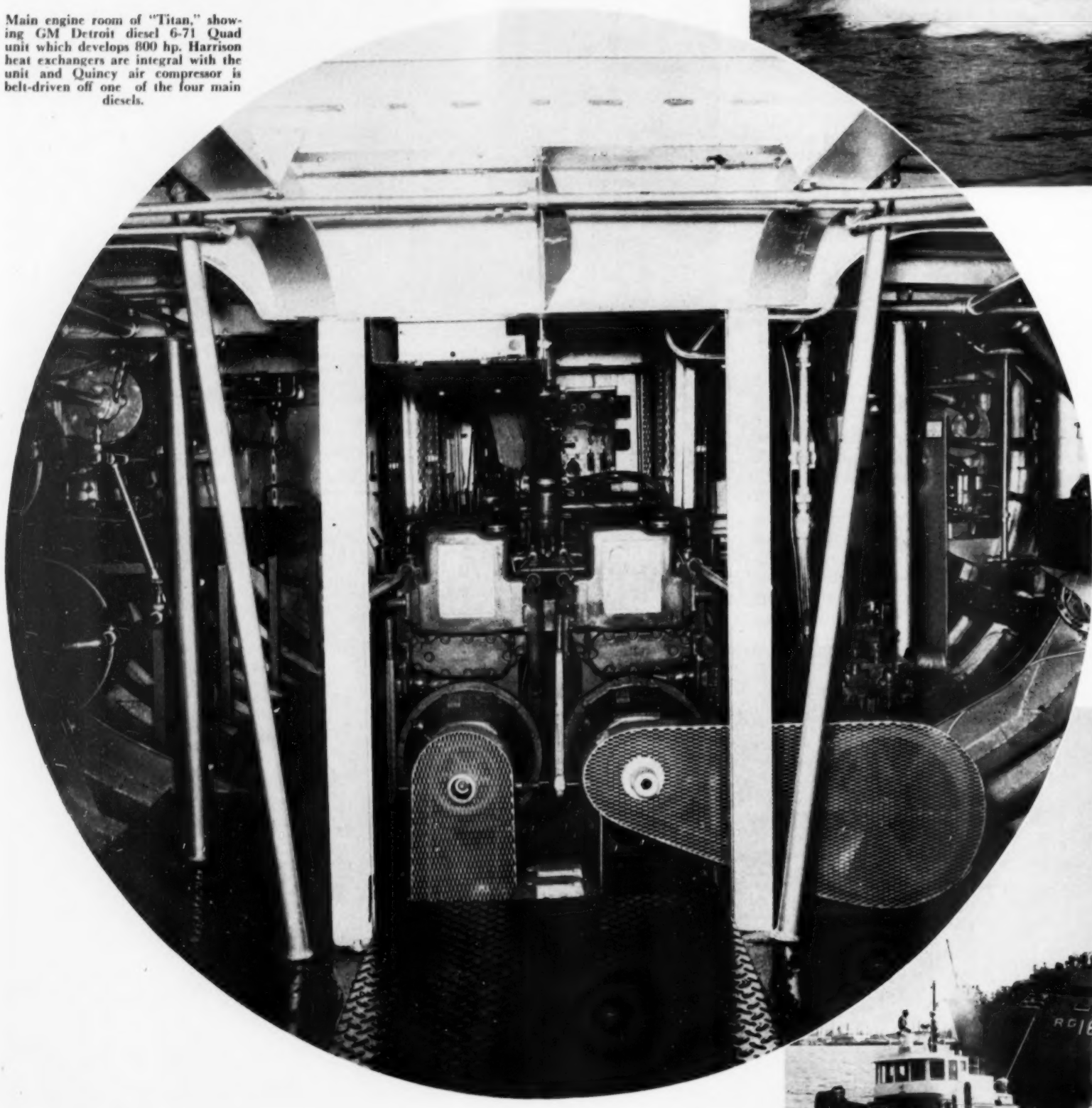
The Nordberg 4FS2-CE diesel generator set pictured below was used to furnish power for Trane units.

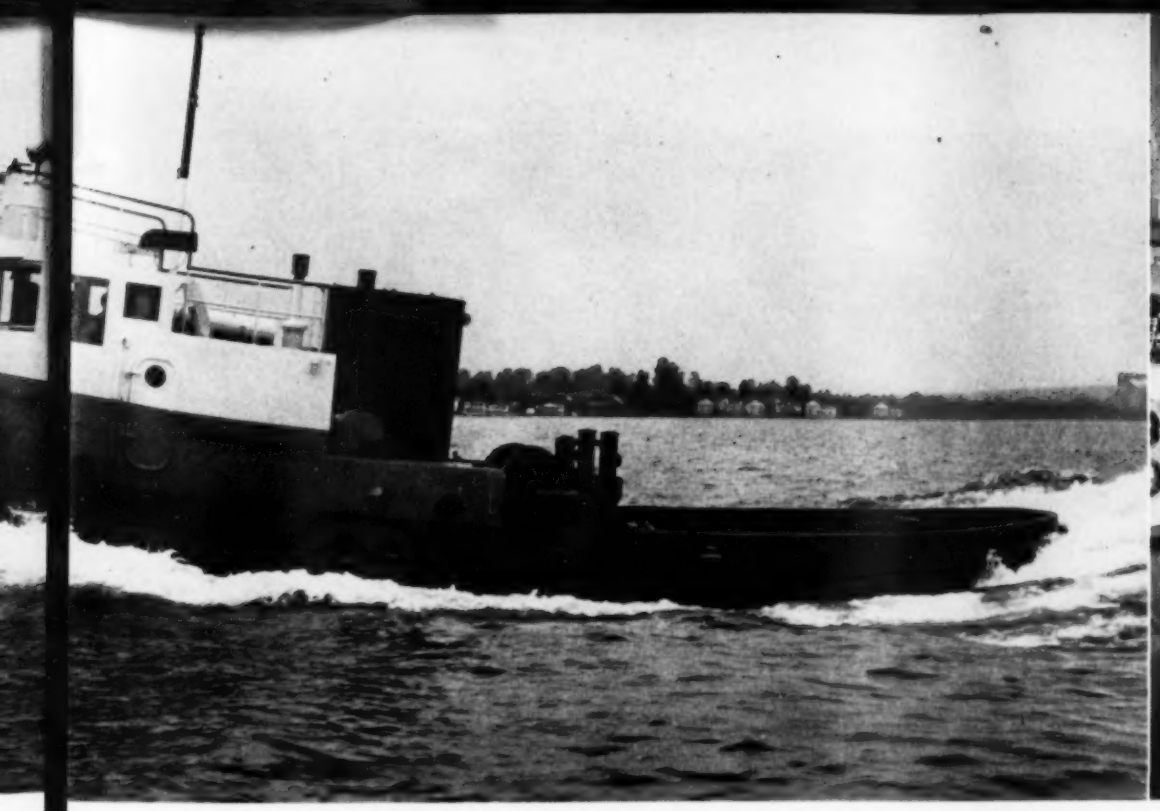


"TITAN" REPOWERED WITH A QUAD

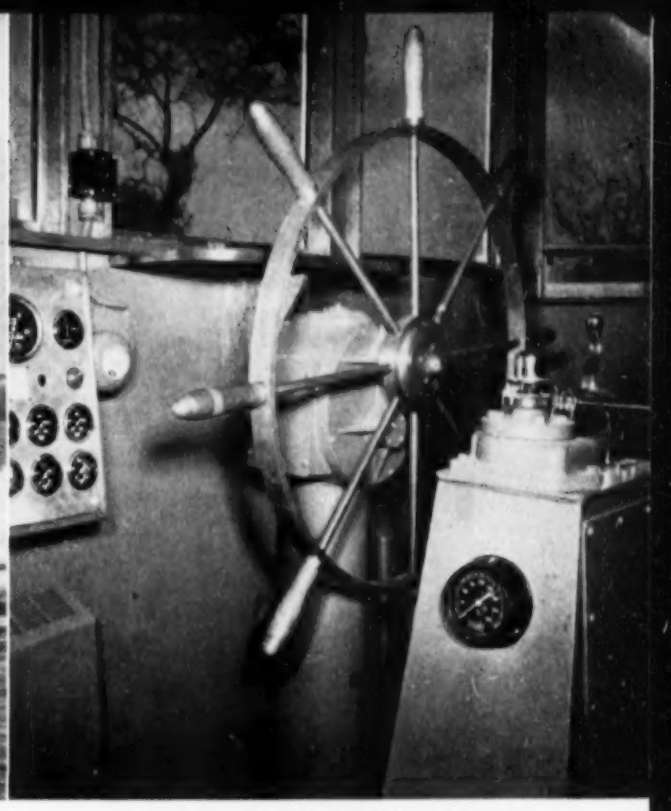
By CHARLES F. A. MANN

Main engine room of "Titan," showing GM Detroit diesel 6-71 Quad unit which develops 800 hp. Harrison heat exchangers are integral with the unit and Quincy air compressor is belt-driven off one of the four main diesels.





Low, rugged lines give an indication of the great power the "Titan" is capable of developing.



Wheelhouse view shows Markey air steering unit, Mather single lever throttle clutch control.

ONE of the smallest, most compact harbor tugs to come out in recent years, in what would normally be considered medium-high power range, is the new welded steel tug *Titan*, completed for Puget Sound Tug and Barge Co. of Seattle. Originally a YTL hull, it was stripped down to a mere shell and completely built up new after ingenious plans worked out between the owners and the firm of McGinitie and McDonald, their broker-representatives. Detail plans were prepared jointly by Hugh McDonald and John Kelly of the Marine Construction and Design Co. of Seattle, who executed the contract. To get relatively high power in a small hull and keep it compact, with plenty of work space around the engines, a General Motors 6-71 Quad unit was specified. This propulsion unit, complete with General Motors hydraulic reverse gear and Falk 6:1 reduction gear, occupies less space than a single engine of half the horsepower, of types generally used in tug work. The entire unit was supplied by the Evans Engine and Equipment Co. of Seattle. It develops 800 hp. The hull is 65 by 17 by 7 ft., 10 in. over-all and entirely of welded steel construction.

The main engine unit drives a 3-bladed Coolidge propeller, 77 in. diameter, through steel tail shafting and cast bronze stern tube unit also built by Coolidge. Control of the main power plant is by a Mather single lever throttle clutch unit, mounted alongside a Markey high-speed pneumatic steering unit, operating a single plate steel rudder. Control stands are fitted both in the pilot house and on top of the pilot house for use in handling large ships close to piers. The vessel carries 4000 gallons of fuel and is equipped to carry five men, with quarters in the forecastle.

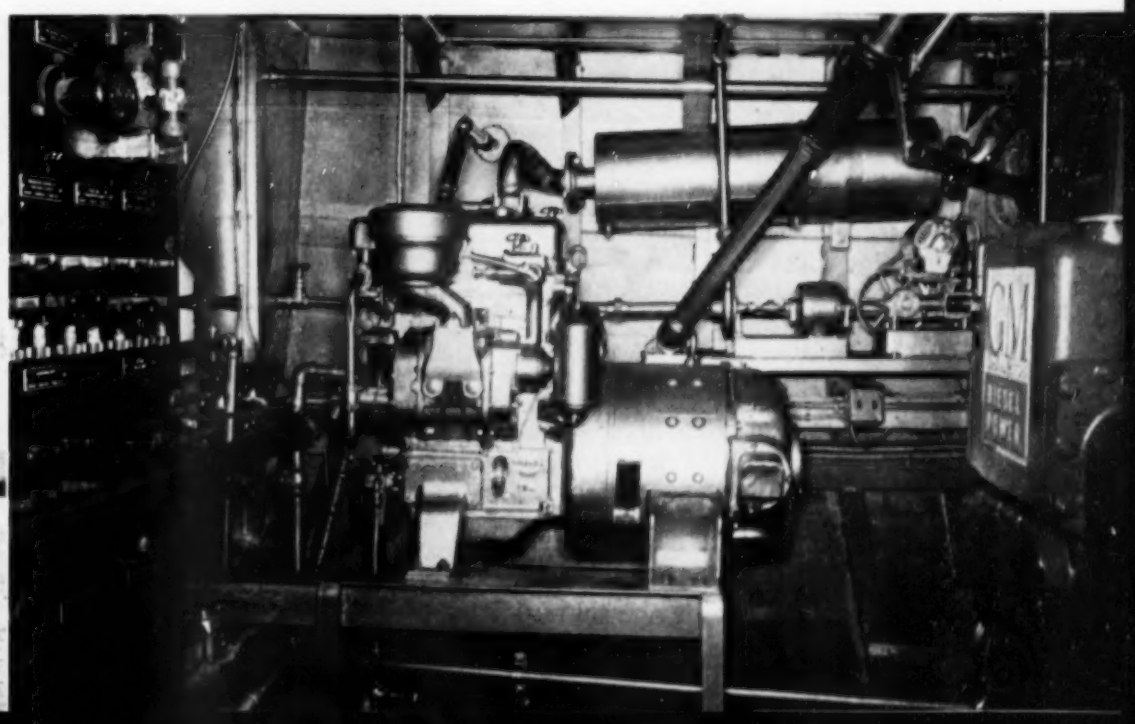
Harrison heat exchangers are built integral with the Quad diesel engine unit, including all fresh and salt water pump units. Lube and fuel oil auxiliary pumps are also driven off the main engine unit. A Quincy air compressor with cooling fan-flywheel is belt-driven off the forward end of one of the four main diesels.

A surplus 20 kw. 2-cylinder 2-71 GM diesel auxiliary generating plant is fitted, which charges a 110-volt battery set for lighting when the auxiliary is shut down. A Markey 10 hp. vertical capstan and anchor winch unit is fitted with a Gardner-Denver airmotor.

A Markey 10 hp. electric towing winch is fitted on the rear deck. Below is a Burnham home type oil-fired heating boiler with Trane convectors. Main switchboard is by Harris Electric Co. of Seattle. Maxim silencers are fitted in the stack serving all five diesels.

"Titan" handling the 422-ft. military transport "Kermit Roosevelt" in Seattle harbor.

GM model 2-71 diesel auxiliary generating set, a 2-cylinder unit, delivers 20 kw.



RISS ADDS $14,000,000 IN DIESEL TRACTORS, TRAILERS

By W. L. BODE

One of the tractor and trailer units designed for Riss & Company of Kansas City, Mo., in one of the largest private orders of motor carrier equipment in history. Tractor is one of 500 units manufactured by General Motors.

DELIVERY of one of the largest private orders of truck tractors and trailers in history began recently as Riss & Co., Inc., of Kansas City, Mo., the nation's third largest truck carrier, accepted the first units of the $14 million job which has made history in the automotive world. Richard R. Riss, chairman of the board and founder of the Riss company, hailed the transaction as "a demonstration of our unqualified faith in America's economy. . . . As proof of our faith in the soundness and vigor of America's economy, we are making the biggest investment in trucking history . . . Our industry is at the brink of its great new era."

Several suppliers have completed plans for the delivery of equipment to Riss & Co. headquarters at Kansas City or to one of the 27 major terminals located between Denver and Boston. Fruehauf Trailer Co., Detroit, is delivering 1300 trailers to key points in the 22 states served by the company. They are manufactured at the Memphis, Tenn., and Westfield, Mass., plants. Four hundred of the trailers are insulated mechanical refrigeration units for transporting perishable goods. These Thermoking units are manufactured by the U. S. Thermo Control Co., Minneapolis. The remainder are van trailers. One hundred van trailers have also been purchased from Strick Trailer Co., Philadelphia.

Five hundred truck tractor units, said to be the largest single private order of this type, are now in process of delivery to Riss from the General Motors Truck and Coach Division at Pontiac, Mich. These tractors are of special design, prepared by GM engineers in cooperation with a Riss engineering team.

The tractors are of the cab-over-engine type, designed for 2-man driver teams. They embody the findings of a Harvard University study of driver fatigue and safety. Each has a specially designed sleeping unit, permitting one man to sleep while the other drives, thus making faster, cheaper service available to customers. The tractors are powered by 200-hp., 6-cylinder diesel engines. Also incorporated in the new tractor units are a number of new safety devices insuring better protection for drivers and other cars. The tractor units were designed with the twofold purpose of improving driver comfort and safe performance. The high-back seat insures better back support for drivers and reduces fatigue. Improved vision has been achieved through increased height of the driver's seat (nine feet from the ground) and the installation of "easy-eye" glass. Over-all length of the tractor and trailer unit together is 45 ft. The trailer itself is 35 ft.

A Fuller Road Ranger transmission with 10 selective gear ratios furnishes quick, easy shifting with only one lever. "Power steering" has been installed, and a new wheel only 20 in. in diameter makes steering much easier. Clutches are of a single-plate, die-disc type. Accelerator and brake pedals are mounted on the same plane for faster braking action. Special electric defrosters keep giant adjustable mirrors on each door of the cab clear in wintertime.

Other features include self-canceling directional signals, redesigned instrument panel which can be read with a single glance and a switch enabling the driver to blink his marker lights for passing without having to turn off his headlights. Vibration in the tractor is reduced to a minimum through a new mounting of the rear axle carrier. The rear axle is a Timken tandem pusher type, with a model R-235 double reduction carrier, ratio 5.9:1. The carrier is "top-mounted," resulting in an almost parallel driveshaft, which reduces vibration. Annoying rattles have been reduced materially.

Richard R. Riss, founder and chairman of the board of the nation's third largest motor carrier. Conversion of the Riss fleet calls for 500 new tractors, 1400 trailers.

Robert B. Riss, 27, is president of Riss & Company. The Riss order is for 1300 trailers from the Freuhauf Trailer Co., Detroit, and 100 trailers from Strick Trailer Co., Philadelphia.

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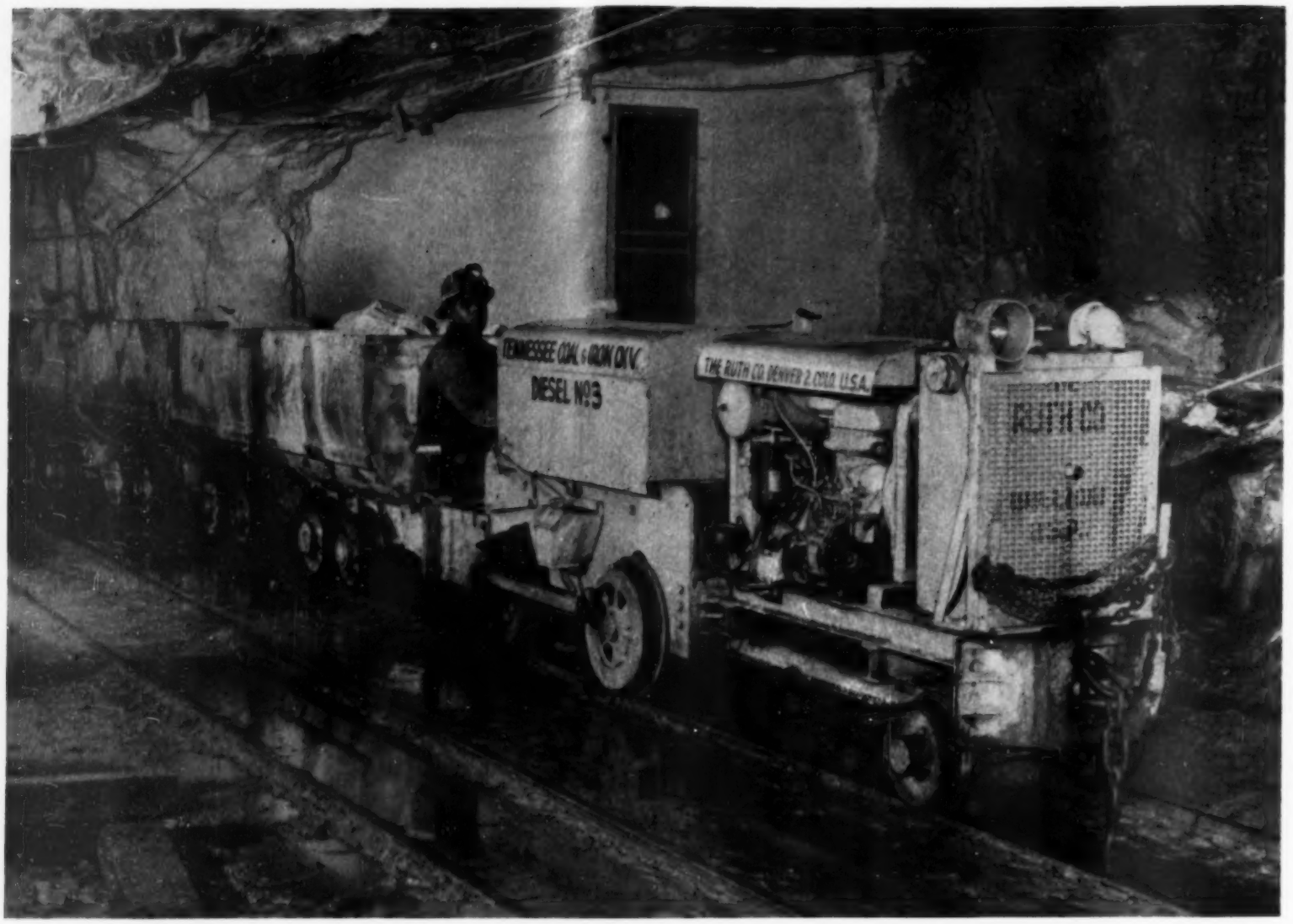

Trammer-type locomotive in operation at Jefferson City zinc mine of U. S. Steel Corporation's Tennessee coal and iron division is powered by a 2-cylinder Hercules diesel engine. This unit is one of four in use at the mine; a fifth is held in reserve.

UNDERGROUND DIESELS

IN December of 1949 a Hercules diesel mining locomotive went into operation at the Jefferson City zinc mine of the U. S. Steel Corp.'s Tennessee coal and iron division. The locomotive was built to operate in the space limitations of that particular mine, and its construction and design technics are similar to those used in other Hercules-powered underground mining diesel locomotives.

This trammer-type locomotive is 48 in. high, 39 in. wide and 14 ft. long. The engine and driving mechanism are separate and carried on two 2-wheel chassis to permit use on short radius curves. The power is furnished by a 2-cylinder, 4-cycle, indirect injection, Hercules model DIXD diesel engine. It develops 20 hp. at 1200 rpm. and 30 hp. at 1800 rpm. The engine is connected to the driving mechanism by a fluid coupling. The locomotive pulls an average of 16 loaded cars per trip to the mine shaft. These are 35 cu. ft. Lorain cars carrying about 1¾ tons of ore each.

Since the installation of the first unit in 1949, four similar units have been purchased. At present four are underground with the fifth unit as a spare. All five are powered by Hercules diesel engines equipped with stainless steel exhaust gas conditioners attached to the front of the engine unit. A preventive maintenance program is carried on whereby the equipment is serviced weekly. About every 12 months each engine is brought to the surface for overhaul. Rings and valves are serviced if necessary. The company has found that this type of maintenance is conducive to long engine life and reduces down time to a minimum. The operating company, which has pioneered the use of diesel locomotives underground, is convinced that this equipment can be operated with safety underground. Normal precautions are taken to assure proper mine ventilation and other recommended protective measures.

Many mining operations are reported to be considering the use of economical diesel engines in underground mine service. Recently the U. S. Bureau of Mines issued approval to the National Mine Co. of Beckley, W. Va., to cover its design of a 10-ton diesel haulage locomotive for operation in coal mines.

Dieselized locomotives have been operating with safety in underground service in European mines for many years. Although full utilization of the economies of the diesel in this type of service is yet to be realized, enough experience has been gained abroad and in the United States to demonstrate that modern underground diesel locomotives, when operated in strict conformance with recommendations of the bureau of mines, can be used efficiently.

Florida Diesel News

By Ed Dennis

SOUTHERN DIESEL Sales of Fort Myers has been appointed authorized dealer for the Detroit Diesel Engine Division of General Motors Corp., for Charlotte, Lee, Hendry and Collier counties. Roy T. Sorrell, who has a background of many years in the diesel engine industry, is manager.

RECENT CUMMINS diesel installations were: an NHB 600 rated at 200 hp. in a Mack hi-way trailer for Hall-Mack Electric Co. and a JBS 150 hp. in a Reo for Webb Bros. of Hollywood.

AT HOMESTEAD, the Royal Palm Ice Co.'s plant, one 4-cylinder Fairbanks-Morse rated at 240 hp. The other Fairbanks-Morse is rated at 100 hp. General Electric and Western generators are used with the York refrigerator compressors to make over 100 tons of ice daily.

THE YACHT *Alcazar* from Havana, Cuba, has had installed a 20 kw. Delco-Remy diesel generating plant. Her main propulsion is a pair of GM 6-71 engines.

KISSEMMEE on Lake Tohopekaliga will have a second Fairbanks-Morse generating unit installed, rated at 2100 hp., with a 1500 kw. Fairbanks-Morse generator.

FLORIDA-GEORGIA Tractor Co., Miami, delivered to the De Fonce Construction Co. a Drott skid shovel powered with an International Harvester TD9 diesel engine.

AT FORT LAUDERDALE the 18x36 dredge being built by Joe Benton received two industrial type GM 6-71 diesel engines from Auto Marine Engineers of Miami for the 8-in. Pecor pump. A 2-71 GM is used for the winch and cutter.

AT PASCAGOULA, Miss., the Ingalls Shipbuilding Corp is building the 95-ft. *Rhonda III* powered with two D 397 Caterpillar diesel engines. Total horsepower is 1000. It will be the largest and finest yacht built in 1954 in the U. S.

FLORIDA DIESEL Engine Sales at Jacksonville supplied the GM 6-110 diesel engine for the *Saint Ann,* a mackerel fishing vessel built at St. Augustine for Leo Favaloro of Gloucester, Mass. Included were an Allison 4.5:1 reduction gear, Onan 3000-watt diesel generating set.

HALLETT generating sets were included in the newly launched shrimp trawlers *Driftwood* for Paccette of Fort Myers and *Little Mitch* of Jacksonville. Both are about 75 ft. in length and are powered with Murphy diesels.

SINGLETON Shrimp Co. of Tampa received a GMC dieselized hiway refrigerated trailer named "The Thermo King" which makes a total of six in the fleet. Carolina Southern Motor Express also received a 6-71 powered job.

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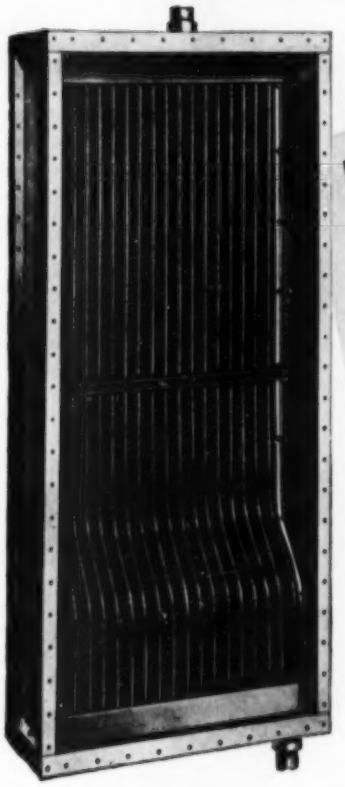

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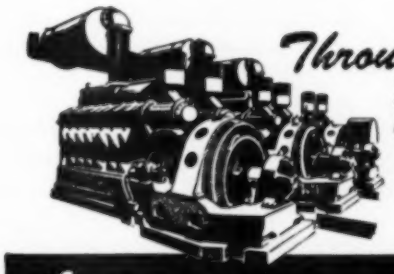

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WHAT'S GOING ON IN ENGLAND

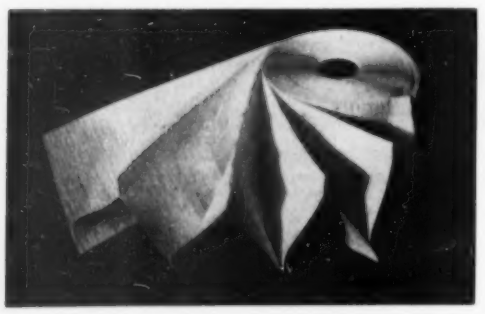
CONDUCTED BY **HAMISH FERGUSON**

Hamish Ferguson received his training and early experience with the English Electric Company. Subsequently, he spent a number of years with a firm of diesel engine consultants, London, and in 1944 became secretary to the Diesel Engine Users Association. In 1953, he relinquished his appointment to devote his time to private consulting work connected with diesels and gas turbines.

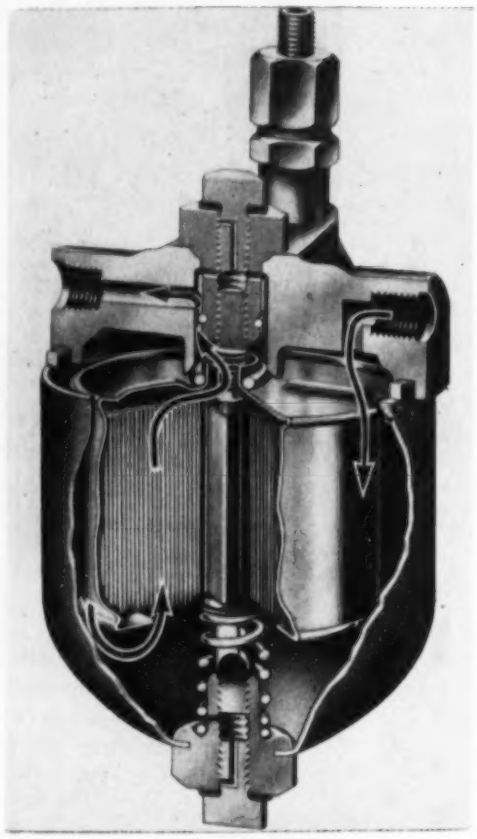
C. A. V. PAPER ELEMENT FUEL FILTER

ALTHOUGH C.A.V. Ltd., of Acton, London, is best known to diesel users for its comprehensive range of fuel injection equipment, the fiun also manufactures a variety of equipment for engine-powered vehicles. These include the "electrics," such as starters, direction indicators, door operating gear and switchboards. Alkaline batteries are another specialty. The latest C.A.V. product is a fuel filter for which an exceptional efficiency is claimed. Following a long period of research and experimentation, a paper filter was decided upon. With a background of improved knowledge of the mechanism of filtration, the design of a new type of filter was commenced. Following wear tests, a paper was selected as the filtering medium which gave an adequate performance in stopping particles. From choking tests it was possible to decide the area necessary to give a filter which would pass at least as much fuel as a cloth filter before choking. The size of the filter had to be kept down and sufficient free volume allowed to accommodate the solid material.

The paper element itself is contained in a thin metal canister, and the paper strips forming the element are wound around a cylindrical core in the form of a spiral. The strips are cemented together at top and bottom in such a way as to form a series of continuous v-shaped coils. A large filter area is thus provided with minimum filter bowl dimensions ; it is claimed that six times the filter area of the normal cloth filter is provided within a bowl two-thirds the normal size. The filter is of the cross-flow type, the inlet and



C.A.V. paper filter element clean, cut and opened to show formation.



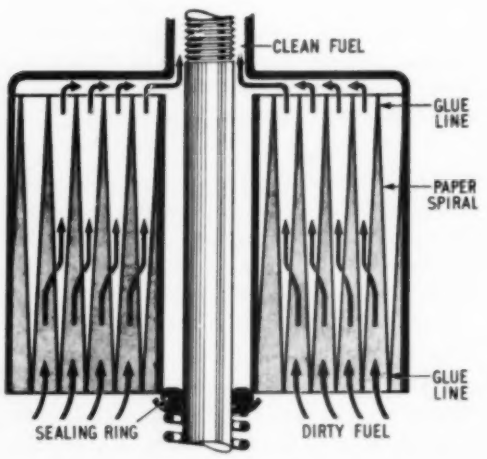
Cutaway of C.A.V. filter with flow lines.

outlet connections being carried on the cover, which also incorporates a support bracket. The bowl is of pressed steel and forms an oil-tight container for the paper element. An air vent is also carried on the cover in addition to a gravity vent valve or pressure relief valve as may be required. A drain plug is fitted at the bottom of the bowl. The removal of the filter element for replacement is a simple operation and can be undertaken without disturbing the fuel piping. The paper elements are not intended to be cleaned and should be discarded when choked.

The paper used for the filter is specially impregnated and is of high strength when wet. It has been subjected to many tests to insure that it is sufficiently robust and can stand up to severe conditions. These have included boiling the elements in water for some hours and then subjecting them to suddenly applied pressures of up to 45 psi., followed by the circulation of a mixture of oil and water at 80°C. accompanied by severe vibration for periods of up to 50 hours.

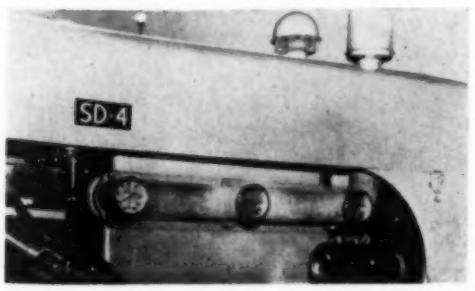
Following the production and testing of prototypes, a large number of filters was put into service in all parts of the world for field testing. Some filters remained unchoked even at a mileage of 45,000 ; to date, however, the great majority of the filters recovered from service were unchoked, and so only give a minimum estimate of average service period, at 14,000 miles. Two instances of lives below 10,000 miles have been found, but in both cases this was due to abnormal fuel. Owing to the widely differing conditions of operation which have to be considered, precise instructions for servicing intervals cannot be stated for filter elements ; the servicing period will vary according to the type of fuel used and the operating conditions.

From the field test results, together with full scale tests with fuel oil, it is estimated that with the normal run of fuels an element should not choke in less than about 1500 gallons of fuel, the actual value depending upon maximum flow, pressure drop, etc.



FLOW THROUGH FILTER ELEMENT

Checking Fuel Injection Systems



A highly effective method of checking fuel injection systems on diesel engines with Dillon bi-metallic, dial-type thermometers is standard factory and field service procedure at the R. H. Sheppard Co. of Hanover, Pa., manufacturer of the Sheppard diesel line.

As the accompanying photograph shows, the Dillon thermometers are screwed into the exhaust manifold for the test. If all thermometers register equally, and if this temperature corresponds to factory standards, the fuel pump is known to have been calibrated correctly. Otherwise, it is readjusted to produce the proper amount of fuel. If any one thermometer reads higher or lower than the others, it indicates that the fuel injector feeding the cylinder to which this particular instrument is attached is not adjusted correctly. And in cases where one thermometer services a pair of cylinders and the reading indicates that one of the cylinders is receiving too much or too little fuel, the unadjusted injector is quickly determined by alternately cutting out one cylinder at a time.

Although the Dillon thermometers used by Sheppard are of 200-1000°F. with 5-in. stems and 3-in. dials, these instruments are available in 32 other standard models with stems up to 72 in. in length and ranging down to —40 to +160°F. Dials are available for the various combinations in 5, 3 and 2⅜-in. O.D. All instruments are warranted to have a tolerance of 1% of the range over the entire scale. For further information on the Dillon thermometers, write DIESEL PROGRESS, File No. 117, Box 8458, Cole Station, Los Angeles 46, Calif.

Army Lets Big Truck Contract

A contract for 121 trucks capable of hauling 30,000-lb. loads over roadless terrain has been awarded to Mack Trucks, Inc., by the U.S. Army Corps of Engineers for the Navy's Bureau of Yards and Docks, according to Elliott G. Ewell, Mack vice president. Deliveries on the $2,000,000 order will start this month.

The big off-highway vehicles will be powered with 200 hp. Cummins diesel engines. They will have 10-speed transmissions and special rear-axle planetary gears to deliver power to the wheels and still accommodate their heavy loads. Special "quarry bodies" of 11-cu. ft. capacity and dumping mechanism will equip the trucks for heavy-duty earth-moving service.

Distributor Sets Sales Record

Briggs Filtration Co. of Washington, D. C., points to an enviable sales record achieved by its Cuban distributor, Millares y Cia., Havana. In a 10-month period Millares sold four filter cases daily, according to Hugo Hartenstein, Briggs representative in Havana.

This summer Millares launched a "filter a day" campaign among its salesmen, with cash bonuses as an incentive for increasing sales threefold during a period generally considered the slack season. The 10-month average of four filters a day was gained despite the fact that little new equipment was purchased during the sugar mill grinding season, and sales were limited to other industries, Mr. Hartenstein reported.

New Catalog Available

"Stock Roller Chains and Sprockets" is the title of Catalog 754, a 64-page illustrated book just published for distribution by Diamond Chain Co., Inc., Indianapolis 7, Ind. The catalog covers a complete line of roller chain stock sprockets. Stocked by distributors in industrial areas, the line includes minimum bore sprockets for reboring as well as finished bore and Taper-lock bushed sprockets which are ready to use.

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P.O. Box 590, Bell, California
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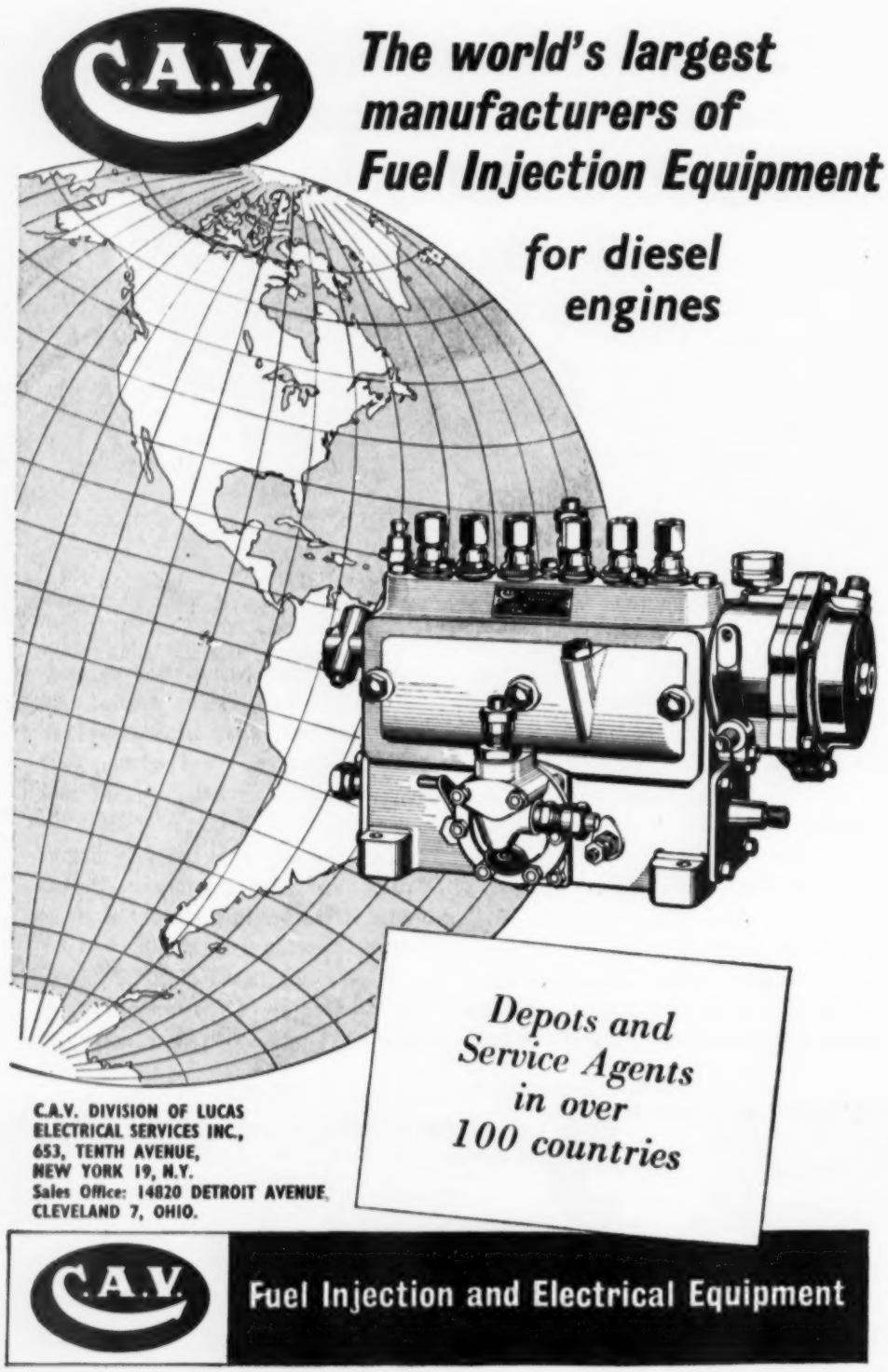
Two New Towboats for Fleet

The inland waterways fleet of Mississipi Valley Barge Line Co. will be augmented by the addition of two twin-screw towboats to be built at the Neville Island Shipyard of Dravo Corp., Pittsburgh. The two vessels are designed to operate over the entire Mississippi river system. They will be powered by Nordberg diesel engines turning large-diameter propellers through Modern Wheel Drive reverse-reduction gears. The towboats will be fitted with Dravo Kort nozzles on hulls of improved design, developed through research at the model basin in the Netherlands.

Key West-Cuba Ferry Service

Ferry service between Key West, Fla., and Cuba, the first since the 1935 hurricane swept away the "railroad-that-went-to-sea," will begin Oct. 2. The *City of Key West*, a 203-ft. converted Navy LSM, will run between Key West and Cardenas, Cuba. The ex-Navy craft was converted by the Dade Drydock Corp. and is powered with two 10-cylinder, 1800 hp. Fairbanks-Morse opposed-piston type diesel engines.

N. C. Hines, executive vice president of Caribbean Ferry System, said the ferry will carry 40 autos and 250 passengers.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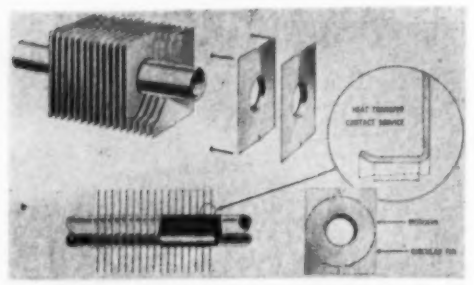
Young Engineers Monofin Core



The new Young Monofin core, a plate type fin and round tube core made up of seven fins per inch, provides 58% more extended surface and seven times more heat transfer surface than circular fin cores provide with edge contact, according to the manufacturer, Young Radiator Co., Racine, Wis., and Mattoon, Ill.

Versatile Monofin cores are adaptable for engine cooling units and for cooling oil, gas, compressed air and for air conditioning heating and cooling functions. Young Radiator Co. lists these seven Monofin features: Monofin collar contact adds more "bursting strength" to the tube (much as a fish pole is strengthened at the winding); the collar contact completely encases the tube to protect it from injurious impingement and atmospheric corrosion. Straight in-line fins permit ease of air flow, which causes less turbulence and resistance for greater fin cleanliness. Monofin has a lower horsepower requirement, and it has a positive mechanical bond to the tube, insuring required maximum performance (hot and cold cycles do not loosen the tube-fin assembly). Tubes sheathed with Monofins are removable when damaged and Monofins can be used on any tubing material without braze or solder problems.

A new catalog offered by Young describes the Monofin core, pointing out main features and illustrating the new product with cross-section drawings. Copies of the catalog, No. 5554, are available from the company.

Link-Belt Offers Catalog

A new 340-page standard products Catalog 950, providing easy and rapid selection, has been published by Link-Belt Co., 307 N. Michigan Ave., Chicago 1. The products shown fall into several major classifications, including chains and sprockets for conveying, elevating and power transmission. Tables of pre-engineered drives facilitate the selection of standard roller chain drives and silent chain drives. Complete listings are given of stock and made-to-order chains and sprockets. Catalog 950, with its flexible cover and thumb index, offers clear, concise capacity charts and dimension tables to aid engineers or layout men in rapid selection of standard products and stock items for new installations. Copies of the catalog may be obtained by writing to Link-Belt.

Gulf Coast Diesel Notes

By Michael T. Pate

DIXIE DRILLING CO., Houston, has obtained from Waukesha Sales & Service, Houston, a Waukesha diesel, model 180-DLCU, rated 25 hp. at 1400 rpm., which will be used to power an auxiliary water pump.

ELLERBEE BROS., steel tank fabricators of Port Arthur, Texas, have bought from Stewart & Stevenson Services, Inc., Houston, two 100 kw. ac. generators, each driven by a model 62403 General Motors diesel. Each engine drives eight 400 amp. welding machines and a 50 hp. air compressor. These two bring the company's complement of such units up to four.

HARMS MARINE SERVICE, Orange, Texas, has bought through Houston Engine & Pump Co., Houston, two Murphy diesels, model M-185, an opposite rotation pair to power a tug through a Snow-Nabstedt 3:1 reduction gear. The engines turn up 185 hp. each at 1500 rpm.

GULF OIL CORP., Houston, has powered its new Chris-Craft 26-footer, the *Annie Lou,* with a General Motors model 4087, inclined 4-cylinder diesel rated at 110 hp. The crew boat, driven by this diesel through a 1.5:1 reversing and reduction gear, was clocked at 25 mph. on her trial runs. The engine was sold and installed by Stewart & Stevenson Services, Inc., Houston.

LIGHTHOUSE, INC., Houston, has bought through Waukesha Sales & Service of Houston two Waukesha diesels, model 180-DLCU, generator equipped, which will be used to power fog horns for offshore drilling rigs. The diesels are rated at 25 hp. at 1400 rpm.

PORT IRON SUPPLY CO., Sabine, Texas, has bought from Mustang Tractor & Equipment Co., Houston, a Caterpillar diesel, model D-311, to power a 19 kw. lighting unit on a dredge. The diesel turns up 57 hp. at 2000 rpm.

VASSEY DRILLING CO., Beeville, Texas, has installed a General Motors diesel, model 12103 twin six, on its drilling rig to drive an 8 by 14 Bethlehem mud pump. The diesel was furnished by Stewart & Stevenson Services, Inc., Houston.

M. BOUDREAU, Sunset, La., has replaced a gasoline engine in one of his trucks with a Waukesha model 135 DKB diesel from Waukesha Sales & Service, Houston. The diesel will deliver 147 hp. at 2800 rpm.

HOUSTON PILOTS' Association, Houston, has installed in the boat *Houston Pilots No. 1* a model 62203 General Motors diesel unit equipped with a 3.75:1 reversing and reduction gear. The diesel was obtained from and installed by Stewart & Stevenson Services, Inc., Houston.

FRANK PIKE, Houston contractor, has repowered a dragline with an International Harvester diesel, model UD-350, rated at 68 hp. at 1600 rpm. The diesel was secured from Houston Power Equipment Co.

BREWSTER CO., Shreveport, La., has bought through Stewart & Stevenson Services, Houston, a General Motors model 24103 quad six diesel which it will install on a drilling rig for the H. L. Rowley Drilling Co. They also bought a Stewart & Stevenson model 20 DAS utility unit powered by a General Motors model 2030-C diesel which delivers 20 kw. at 1200 rpm. The unit also powers a 47-cu.-ft./min. air compressor.

STONE OIL CO., Hobbs, N. M., is powering another of its trucks with a model 135-DKBS Waukesha diesel delivering 185 hp. at 2800 rpm. The diesel was sold and installed by Waukesha Sales & Service, Houston.

BELL HARDWARE CO., Donna, Texas, has bought from Buda Engine & Equipment Co., Houston, a model DA844 diesel rated at 140 hp. when turning up 1400 rpm. The diesel will be delivered to Rio Grande Valley Irrigation Co. for driving a deep-well pump.

JOY MANUFACTURING CO., Dallas, is powering a plant hoist with a model 135-DKU Waukesha diesel, secured through Waukesha Sales & Service, Houston.

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This tanker is one of 65 duplicate vessels powered with Model V6 UNION DIESEL engines, 6 cylinders, 14" bore x 19" stroke, naturally aspirated, which continuously develops 560 horsepower at 325 revolutions per minute.

The UNION DIESEL ENGINE Co.

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New Orleans Diesel News

By James W. Calvert

A 50-FT. PERSONNEL transport, powered with twin GM diesels model 62203RA and capable of cruising at 18 mph. with a load of 40 men, has just been delivered to Matt Francecvich of Buras, La., by George Engine Co. of Harvey, La. The vessel, a Sewart Seacraft, will be used to transport drilling crews for Gulf Oil Co. to a water location. It makes an 18-mile run to the Gulf location twice daily. Early operation showed that the personnel transport had cut in half the time of a boat previously used in the service. The engines develop 300 hp. each.

A 55-FT. DIESELIZED tug, especially designed for the shallow bayous of southern Louisiana, was recently equipped and sold to Pellegrin Towing Co., Chauvin, La., by Arthur Duvic's Sons, New Orleans. The tug, *Milka M. Pellegrin,* has twin 300 hp. Atlas Imperial diesels of the series 35, equipped with solid fuel injection systems and Winslow oil filters. They produce 300 hp. at 1200 rpm. In the compact engine room are a Hallett, model D2, 18 hp. diesel operating an auxiliary Hallett generator of 5000 watts, and a Quincy air compressor for starting the main engines. A 2-in. bilge pump of Marine Products Co. operates off a power take-off to supplement the 2-in. Blackmer pumps on the Hallett auxiliary. In the pilot house are Weston tachometers and Westinghouse air throttle and shift controls. The *Milka M. Pellegrin* is to be used in the southern Louisiana oil fields.

GULF REFINING CO. has purchased a GM series 51 diesel engine, model 43200, for use in one of its pumper boats. George Engine Co., Harvey, La., made the sale. The 26-ft. steel boat will be used in shallow water to service producing wells in one of Gulf's off-shore fields. It can develop a speed of 16 mph.

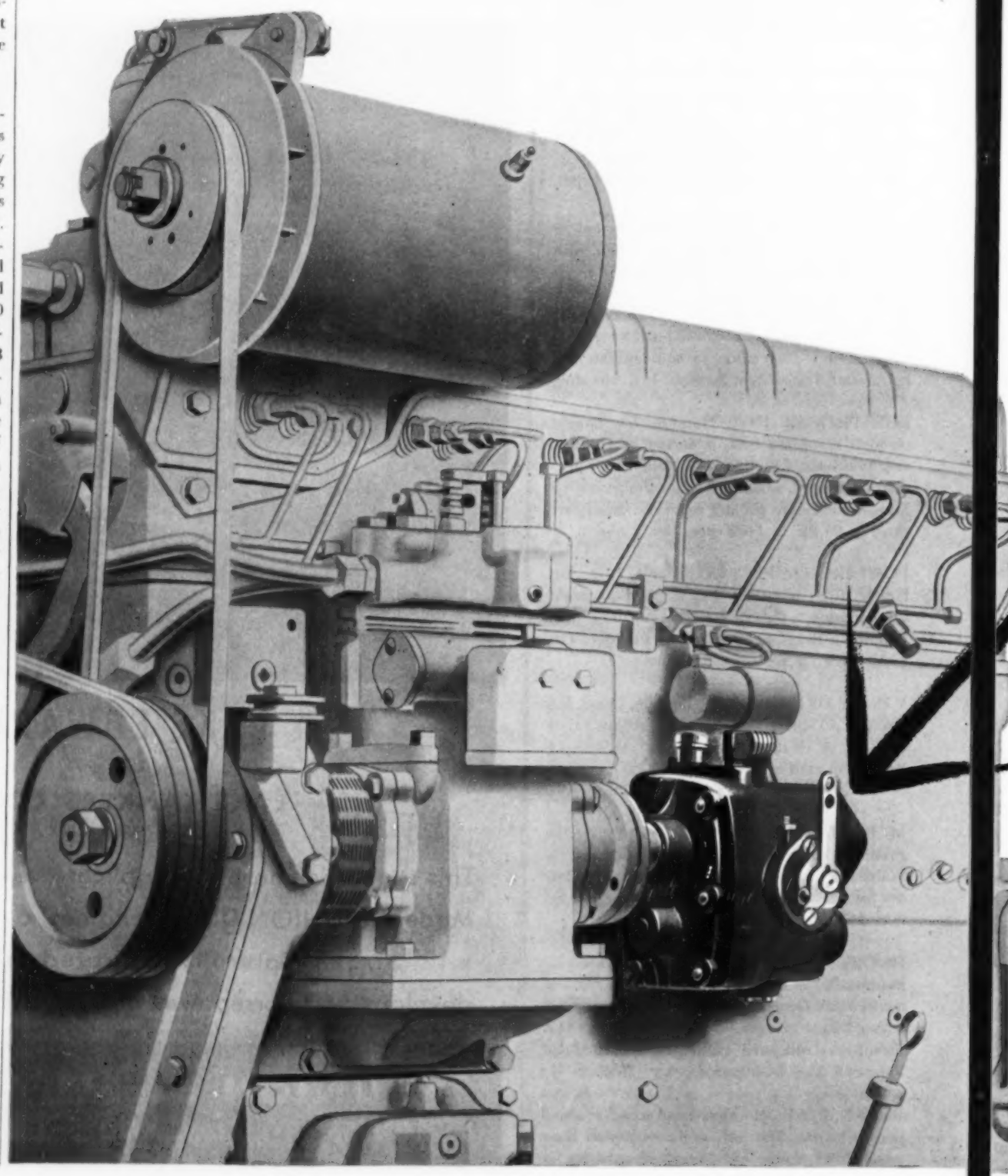
A 66-FT. ALL-STEEL diesel tug, built by Equitable Equipment Co. at its Madisonville, La., shipyard, was delivered to the C. A. Maritima Falcon of Caracas, Venezuela, and made the long ocean voyage from New Orleans to the South American port under its own power. The tug, christened *Las Morochas,* will be used for towing oil and iron ore barges on the Orinoco River in Venezuela. It is powered with an Enterprise model DMM-362, rated at 400 hp. at 800 rpm. Its speed is approximately 12 m... Dimensions are 66 by 17 by 8 ft.

A MODEL 4071A GM diesel ...veloping 138 hp. has been delive...d to Interstate Oil Pipeline Co. of Raceland, La., by George Engine Co. It will be used in a 30-ft. steel work boat, the first dieselized vessel to be commissioned by Interstate.

H. S. MATTHEWS, diesel sales engineer for George Engine Co., Harvey, La., was winner of the W. T. Crowe award for zone No. 7 in the annual competition among General Motors salesmen. He and Mrs. Matthews won a trip to Detroit and a cruise of the Great Lakes. Zone 7 is composed of the states of Louisiana, Arkansas, Tennessee and Mississippi. Merit winners included George Engine Co. salesman John Boatman of New Orleans and Norman Burton and A. W. Adams, Jr. of Houma, La., salesmen of Brady Engine Co.

A TWIN-SCREW towboat, sister ship of the *Mobile,* powered with a pair of 4-cylinder Fairbanks-Morse opposed-piston diesel engines, model 38D8, is

Cummins new, exclusive diesel



being built for Coyle Lines, Inc. at the Arnold V. Walker shipyard in Pascagoula, Miss. The engines were sold by the New Orleans branch of Fairbanks-Morse & Co. The riverboat, 80 by 30 by 10 ft. in dimensions, will have a total of 1170 hp.

TWO GM DIESEL engines, model 4071A, developing 138 hp. each, have been installed in a self-propelled exploration drilling barge for use by a major oil company. George Engine Co. delivered the engines to Berard Brothers of New Iberia, the drilling contractor that will put the barge into operation. The barge also has a 40 kw. diesel generator unit fabricated by George Engine Co. to power the spud motors and winches.

New Head of Research

Col. H. F. Sykes, Jr. recently assumed command of the main research center of the Army Corps of Engineers, the Engineer Research and Development Laboratories at Ft. Belvoir, Va. Colonel Sykes brings a varied experience to his new post. He is a West Point graduate.

Texas Co. Expands Research

The Texas Co. plans "substantial expansion" of its widespread research and technical activities, according to President Augustus C. Long. In announcing the move, Mr. Long said the company is establishing an independent research and technical department and expanding its research facilities at the company's principal research laboratory at Beacon, N. Y.

"The technology of the petroleum industry is advancing with great strides almost daily," Mr. Long said, pointing to "even greater promise in the future." He said the move by the Texas Co. is designed to provide even greater emphasis on the values and benefits to be derived from modern petroleum technology. "We propose to intensify our research as a means of guaranteeing both to ourselves and to the public the greatest possible benefits from the most effective utilization of our vast petroleum resources," the president concluded.

Earlier, the company had announced the election of F. H. Holmes, former assistant general manager of the refining department, as vice president to head up the newly created research and technical department. In addition, M. Halpern, vice president in charge of the refining department since 1940, was elected senior vice president. In his new capacity Mr. Halpern will coordinate all research activities in the company, including those of Texaco Development Corp.

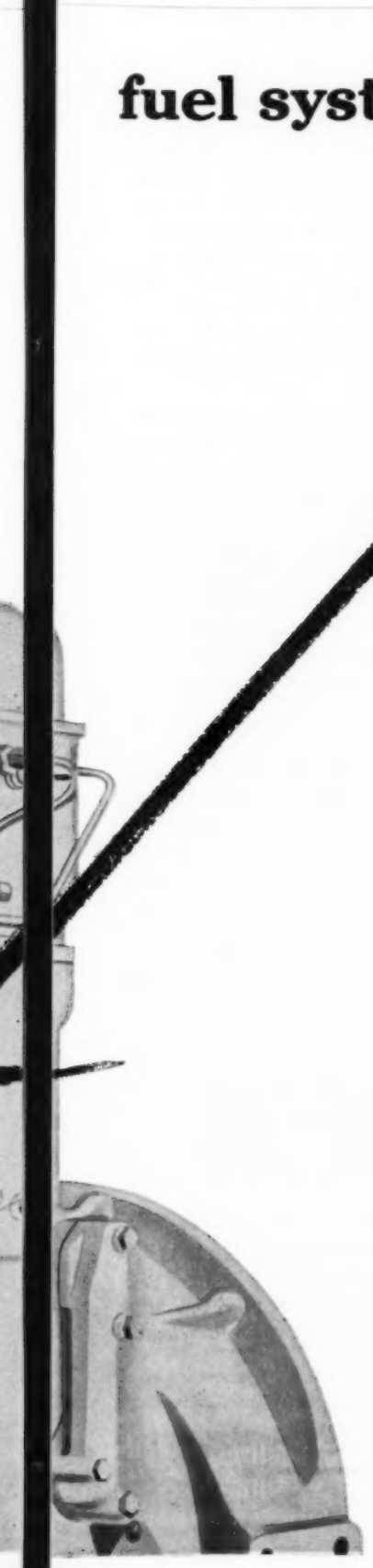
The new department will carry on a program ranging from basic work in physics, chemistry and engineering to the continuous development of new products and processes. In addition, it will provide a variety of technical services to the sales and refining departments. Research laboratories of the company are located at Beacon, N. Y.; Port Arthur and Port Neches, Texas; and Montebello, Calif.

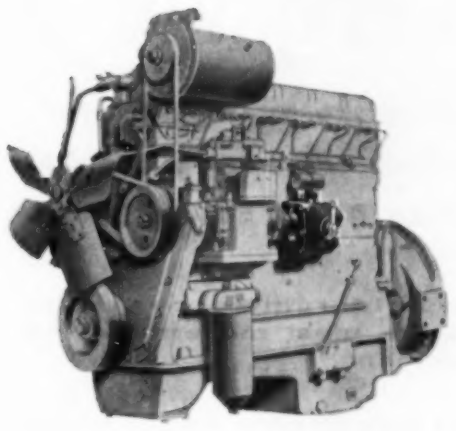
Sales Manager Named

Appointment of J. M. Haynes as manager of engine and compressor sales for U. S. Steel's Oil Well Supply Division with headquarters at Dallas has been announced by G. A. Hays, director of product sales. Mr. Haynes replaces W. C. Ramsey, who has retired.

Mr. Haynes started with Oil Well Supply in 1934 at Mt. Pleasant, Mich., in machinery sales and service. He is a professional mechanical engineer and is a member of A. S. M. E.

fuel system needs no specialists!





PT Fuel System standard on all models...simpler to work with than gasoline carburetion and ignition

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- Compact pump weighs only 13 pounds—system has no fuel racks to adjust . . . no check valves, metering plungers, discs or floats—pump not timed to engine.
- Fewer parts than any fuel system on any heavy-duty engine.
- Adaptable to all Cummins Diesels built since 1932.

Write for your copy of descriptive folder "Cummins PT Fuel System."

CUMMINS **Cummins**

Engine Company, Inc., Columbus, Indiana

Leader in rugged, lightweight, high-speed diesels (60-600 h.p.)

You Have a Date Next June 5

The Oil and Gas Power Division of the American Society of Mechanical Engineers will hold its annual diesel convention at the Statler Hotel in Washington, D. C., next June 5. We realize fully that June 5 is a Sunday, but the committee, in charge of John A. Worthington, has arranged to operate the registration desks on that Sunday so there will not be too much congestion on the following Monday morning.

The meeting officially opens on Monday, June 6 and runs through Thursday afternoon, June 9. The theme of the meeting will be "Oil and Gas Power for National Defense," and Vice Admiral Roscoe Good, Deputy Chief of Naval Operations (Logistics), has accepted the job of local chairman of the meeting. Everything points to one of the most successful diesel conventions of all time, so mark your calendar for June 5, Washington, D. C., Statler Hotel.

IT'S HERE! JUST OFF THE PRESS! Bigger, better, completely revised, rewritten and brought up to date. It's Volume 19 of DIESEL ENGINE CATALOG, now ready for mailing. Mail orders are now being filled for this giant reference book with its all-new, profusely illustrated sections. More than 400 pages. Orders are now being accepted for this limited edition, which costs $10 postpaid plus California sales tax where applicable. Send checks or company form orders to DIESEL PROGRESS, Cole Station, Los Angeles 46, Calif.

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European Diesel News

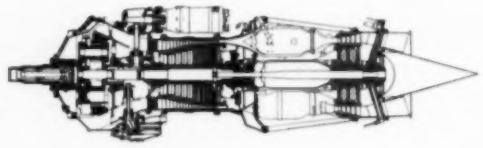
By Hamish Ferguson

PRESSURE-CHARGED DUAL-FUEL ENGINES. The National Gas and Oil Engine Co. Ltd., Ashton-under-Lyne, Lancashire, has carried out much development work on the pressure-charging of gas engines, and in its new range of dual-fuel engines has attained a power and thermal efficiency on a par with those of straight diesel engines.

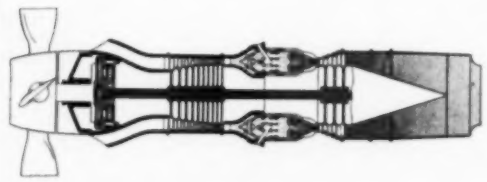
Two ranges of pressure-charged dual-fuel engines are now available. The F2AUG series has a bore and stroke of 12 in. by 15 in. and develops 130 bhp. per cylinder at 500 rpm. with full-load bmep., 121 psi. The B2AUG series has a bore and stroke of 17 in. by 21½ in. and develops 250 bhp. per cylinder at 333 rpm. with full-load bmep., 121½ psi. Fuel consumption at full load for both types is 7000 Btu. per bhp. per hour. Pressure charging is through a British Brown-Boveri exhaust-driven supercharger giving a boost to 6 psi.

PERKINS-INTERNATIONAL HARVESTER. The International Harvester Co. is now offering British-built diesels as first equipment in its range of commercial vehicles. The arrangements now concluded with F. Perkins Ltd., Peterborough, allow for Perkins' engines to be sent to various countries and there fitted into International Harvester vehicles which are supplied either from the International Harvester Co. of Chicago or the International Harvester Co. of Australia Pty. Ltd., of Dandenong, Victoria, Australia.

ATLAS-FORD COMPRESSOR. The Atlas Diesel Co. Ltd., Beresford Street, Wembley, Middlesex, is producing a portable compressor set for which it supplies the compressor and chassis, and Ford Motors Ltd., Dagenham, Essex, provides the engine. The 2-stage, 2-cylinder, single-acting compressor is adjusted to operate between 85 and 100 psi. through an automatic clutch to the 4-cylinder engine which develops 38 bhp. at 1450 rpm.

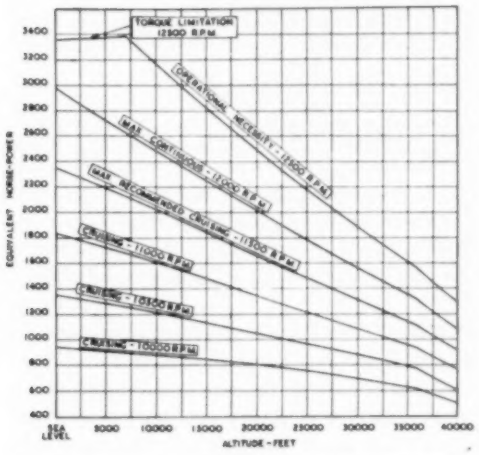


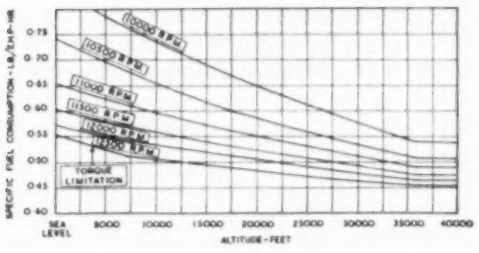
NAPIER "ELAND." D. Napier & Son Ltd., Acton, London, has introduced yet another new aircraft engine. The "ELAND" engine is a single-shaft propellor-turbine engine developing



3000 ehp. for a net dry weight of 1575 lbs. Maximum speed is 12,500 rpm. and the axial compressor is claimed to have the highest performance per stage of any known gas turbine engine, 7:1 compression ratio being achieved in 10 stages. A derivation of the "ELAND" engine is being employed for powering the Fairey Rotodyne aircraft and it is being considered for helicopters.

NAPIER "ELAND" TURBO PROP ENGINE
DEVELOPMENT STAGE N.EL.1
PERFORMANCE AT ALTITUDE
400 M.P.H. T.A.S.
[I.C.A.N. ATMOSPHERE]





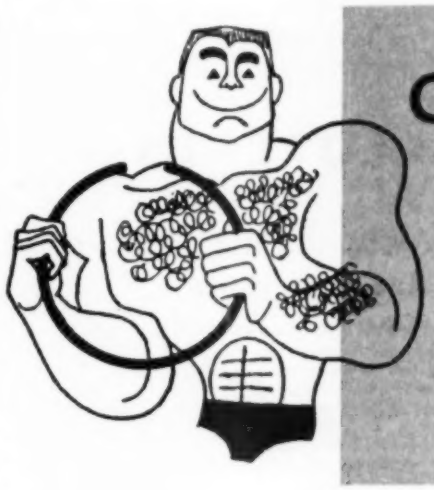
MERLIN CALIMASTER. The Merlin Engineering Co. Ltd., Hebble Mills, Salterhebble, Halifax, England, maker of the widely used Merlin Servicemaster reconditioning machine, has announced a new product, the Calimaster, which is designed for the calibration of multi-cylinder fuel injection pumps. A variable-speed hydraulic drive is used to operate the pump undergoing test and, powered by a 3 hp. motor, the speed can be varied from zero to 2250 rpm. The unit is robust and compact and in addition to the work table and calibration tubes, a header tank and drain are incorporated together with a lift pump. The phasing device is a calibrated ring adjustable to vernier standards.

PESCARA-MUNTZ COMPRESSOR. Alan Muntz & Co. Ltd., Feltham, Middlesex, is now producing in large numbers the Pescara-Muntz compressor. This comprises a free-piston engine and compressor as a single unit. In the diesel cylinder there are two horizontally opposed pistons operating on a 2-stroke cycle. One piston is directly coupled at its outer end to a compressor piston working in the compressor cylinder, while the other is connected to a cushion piston working in the cushion cylinder which is sealed. The cushion end acts as a substitute for the normal engine flywheel in providing the energy to maintain the working cycle. Sole distributor for Pescara-Muntz compressors is Mackay Industrial Equipment Ltd., Faggs Road, Feltham, Middlesex, also the distributor of Allis-Chalmers industrial tractors and General Motors industrial diesels.

SIMMS-AMERICAN BOSCH. It was announced at the annual general meeting of Simms Motor Units Ltd., Oak Lane, East Finchley, London, that its agreement with the American Bosch Corp. had been ratified and that an exchange of technical information is now taking place. Reference was made to the development of a distributor-type pump which should be cheaper than the normal in-line pump and also enable economies in engine construction.

M.A.N. ENGINES IN SCOTLAND. The North British Locomotive Co. Ltd., Glasgow, Scotland, has in the past purchased diesels from a number of engine builders to suit the requirements of its large range of railway locomotives. The firm now announces that it is to build the German M.A.N. engine at its Glasgow works.

BRITISH RAILWAYS. The English Electric Co. Ltd., Preston, has received an order from British Railways for 170 diesel-electric sets for shunting locomotives. Each engine is 350 hp.



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Inland River Reports

By David I. Day

ONE OF THE impressive tows of the month was the one consisting of 18 barges of steel and one of creosote or pipe coating in front of the *A. M. Thompson* of the Mississippi Valley Barge Line. This 2600-hp. Enterprise powered towboat, built at Calumet Shipyard in 1949, will go down in records as one of the "all-time greats."

ALL THE Jones & Laughlin towboats around Pittsburgh and elsewhere are out resplendent in the company colors of green and yellow. We hardly knew the *Vulcan,* built a couple of years back at St. Louis Shipyards. She is propelled by twin Superior totaling 1400 hp.

WE MET the old converted steamer *Claire,* now 315 hp. with Cooper-Bessemer engine, coming down well below Pittsburgh with quite a floating collection—a big dredge, a derrick boat, two mud scows and a barge of coal. She virtually filled the channel. The whole outfit belonged to the M & O Dredging Co., Pittsburgh.

ANOTHER BOAT painted almost out of recognition is the *Crucible* of the Crucible Steel Co., Pittsburgh. This boat is Dravo-built, Superior engines (twins), rated at 1066 hp. The boat is now white with a black hull and red decks.

DENNIS HESTROM, a fine diesel engineer, is now the chief on the triple-screw *Cartasca* in the grain trade between Savage, Minn., and Guntersville, Ala., on the Tennessee. This boat is one of the most peculiar ones in operation, made of three Murray & Tregurtha Harbormasters powered by six General Motors diesel engines totaling 900 hp.

FROM LAWRENCE CURTIS, river fan, we have from New Orleans a very excellent color picture of the *Hardy L. Roberts* of the Lea River Line. It was reported the boat was at Greenville when the picture was taken. She has General Motors twins, 1600 hp.

WE WERE SORRY to hear the M/V *Tell City,* a Maxon-built boat, sank recently not far from the Maxon boatyards at Tell City, Ind. She was raised, promptly repaired and is back at work. She is owned by the Ohio Valley Co. and has twin Kahlenberg diesel engines totaling 300 hp.

CHARLES SWITZER and Ed Shores, engineers on the *Lady Ree,* have come in this month for additional mail praise. We congratulate them. The *Lady Ree* is a very fine boat with a nice engine room and twin General Motors diesel engines totaling 1800 hp.

THE FOLKS on the upper Ohio liked the M/V *George W. Banta* on the occasion of recent trips. We have nice words for this towboat from folks on the Kanawha River also. Built at Avondale, with twin GM engines, she's one of the best.

FOR THE FIRST TIME this summer we had a chance to get a good look at the *Warren Hougland* of the Hougland fleet of Paducah and to admire her upstream speed. This boat came out new from the Nashville Bridge yards in 1938 with new GM engines installed in 1951.

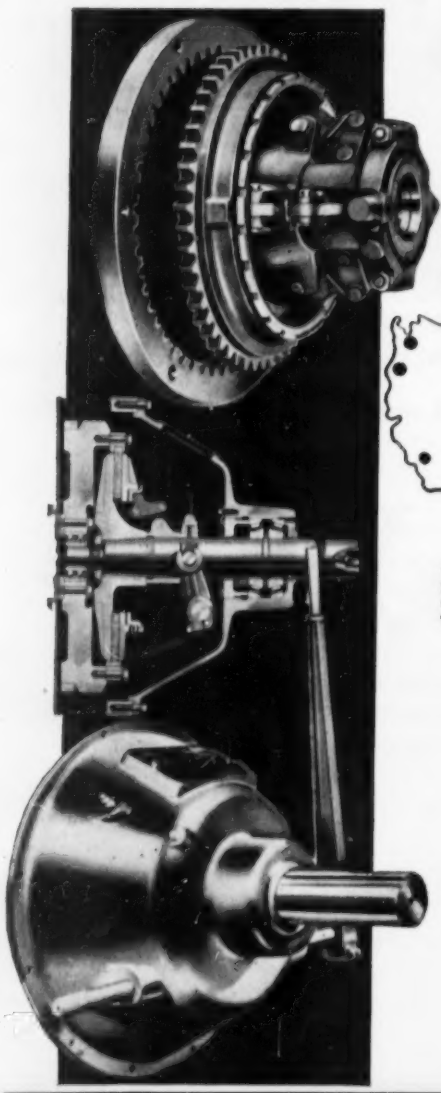
WADE MUTCHLER is still engineer on the fine *Lin Smith* of the Smith fleet of Houston, regularly working in the Ohio River oil trade. The boat is rated conservatively at 3000 hp. triplet Cooper-Bessemers.

MAIL REPORTS indicate the *Cherrystone* is doing fine towing in the oil trade all the way up the Mississippi to St. Paul. F. N. Gregory's letter says: "She's ideal in the 4-to-6 barge class." She was built at Nashville Bridge yards in 1949 and has GM twins, 1800 hp., and is owned by the River Co., Inc., New Orleans.

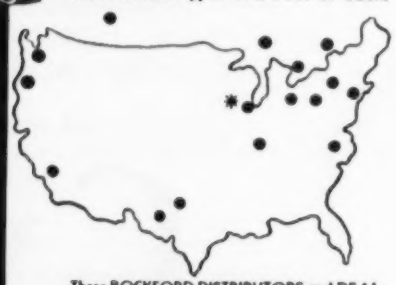
Miami Warehouse Opens

Electro Diesel Corp. has opened a new warehouse at 3618 N.W. North River Drive, Miami, Fla., carrying a complete line of engines, motors, generators, parts and accessories. The warehouse is well stocked with brand new surplus material purchased from the government. The industrial and marine equipment firm maintains offices at 675 N. Shore Dr., Normandy Isle, Miami Beach.

ROCKFORD Heavy Duty CLUTCHES
and
Power Take-Offs
Are Distributed
Coast to Coast



Wherever industry uses heavy duty clutches or power take-offs there is a ROCKFORD distributor conveniently close at hand to supply ROCKFORD Heavy Duty CLUTCHES, POWER TAKE-OFFS and replacement PARTS for numerous types and sizes of each.

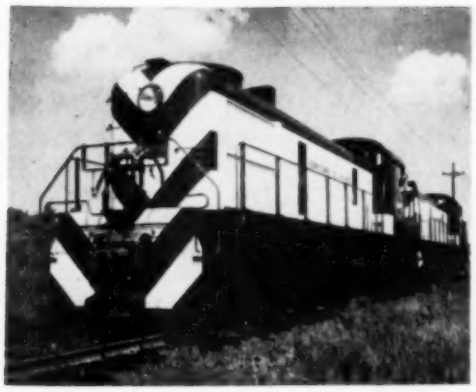


These ROCKFORD DISTRIBUTORS and DEALERS carry a stock of clutches, power take-offs and replacement parts to insure ROCKFORD clutch users prompt delivery and service.

Continental Sales & Service Company, Los Angeles, Calif.
Lightbourn Equipment Company, Dallas, Texas
Atlas Auto Parts & Grinding Co., Louisville, Kentucky
Wepco Equipment Company, Cleveland, Ohio
Genuine Motor Parts, Pittsburg, Pa.
Auto Clutch & Parts Company, Chicago, Illinois
Auto Gear & Parts Company, Philadelphia, Pa.
General Machine Parts, New York, N. Y.
Highway & Industrial Equipment Co., Inc. Raleigh, N. Carolina
R. Angus (Alberta) Ltd., Edmonton, Alberta, Canada
Moose Equipment Co., Ltd. Montreal, Canada
B-W-H Service Parts, Ltd., Merritton, Ontario, Canada
Credle Equipment Company Utica, New York
Engine Service & Supply Company Odessa, Texas
National Supply Engine Corp. Portland, Ore. and Seattle, Wash.

ROCKFORD CLUTCH DIVISION BORG-WARNER
1321 Eighteenth Avenue, Rockford, Illinois, U. S. A.

Diesel Locomotives Delivered



Two Alco 1600 hp. road switching diesels, coupled for multiple-unit operation, are shown during tests at Schenectady prior to delivery to Mexican railroad. The units were ordered from American Locomotive Co. as part of a 4-year modernization program.

Eight new 1600 hp. diesel locomotives have been delivered to the Pacific Railroad (Ferrocarril del Pacifico) of Mexico by American Locomotive Co., Schenectady, N. Y., making a total of 25 Alco diesels operating on the road. The last of the 6-motor, road switcher-type units have been shipped from Alco's shops to the road's northern terminus at Nogales, Ariz. They will be pressed into immediate freight service as part of an over-all $80 million 4-year modernization program designed to rehabilitate the entire line, toward which the International Bank for Reconstruction made a loan of $61 million in August.

The Pacific Railroad, built in the early 1900s and owned by Southern Pacific until it was bought by the Mexican government in 1951, provides the only rail service running from the U. S.-Mexico border through the states of Sonora, Sinaloa, Nayarit and Jalisco.

After helping to haul the 1954 bumper crop of some 8000 carloads of wheat to market from this rich agricultural region, the Alco diesels will aid in moving approximately 8000 refrigerator car sof tomatoes and other produce to Nogales.

The modernization plan for the line includes re-laying of almost the entire 1200 miles of track, repairing bridges, replacing steam motive power with diesel locomotives, etc. Immediate plans made possible by the $61 million World Bank loan include purchase of all-purpose diesel locomotives, light service diesels, new freight cars, railroad ties and new shop equipment.

Pyrometer Bulletin Available

The new Illinois Testing Laboratories Bulletin No. 4181, "Alnor Pyrometer Accessories," is available to those concerned with the installation, use and maintenance of pyrometer systems. Specification and performance data for Alnor thermocouples are covered. Also included are notes on thermocouple alloys, temperature-millivolt relationship curves, a list of industrial applications, a convenient temperature conversion table and other information of value to pyrometer users.

Special Representative Named

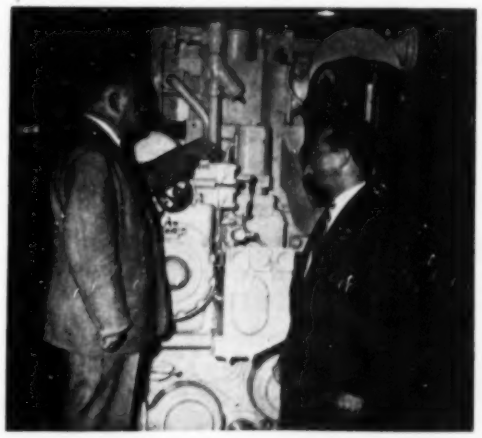
G. L. Bader

G. L. Bader, with more than 25 years of experience in the diesel engine industry, has been appointed a special representative of the engine division of National Supply Co., manufacturer of Superior and Atlas engines. Mr. Bader will be concerned principally with engines for natural gas and petroleum pipeline use. He also will handle marine and stationary engine applications in the vicinity of his headquarters at St. Louis, Mo. Mr. Bader formerly was employed by Fulton Iron Works, Baldwin-DeLaval, Busch Sulzer Co. and Nordberg Manufacturing Co. Since 1951 he has served as a consulting engineer. Mr. Bader is a graduate of Marquette University with a degree in mechanical engineering.

Assistant General Manager Named

L. C. Schweitzer

William C. Dunn, president of Ohio Crankshaft Co., Cleveland, has announced the appointment of L. C. Schweitzer as assistant general manager of the company's TOCCO division. Mr. Schweitzer formerly was Chicago district manager of the division. He joined Ohio Crankshaft in 1939, coming to the firm from Westinghouse Electric Co. where he was employed as an industrial heating specialist. Mr. Schweitzer established TOCCO's first sales office in Chicago. He holds a BS degree in metallurgy from Carnegie Institute of Technology and has had 29 years of experience in engineering and sales in the industrial heating field.



NEW ENTERPRISE DIESEL—John Sheusner, manager of engineering and manufacturing for Enterprise Engine and Machinery Co., shows the new DMG-38 diesel engine, rated at 800 bhp. at 390 rpm., to E. A. Drake, marine superintendent of British Columbia Packers, Ltd., who flew to San Francisco for the recent witness test. The engine will be installed in the M/V "Cloverleaf," 146-ft. combination towboat and packer that will ply between British Columbia Packers, Ltd., plants, delivering supplies from Vancouver and returning with fishery products.

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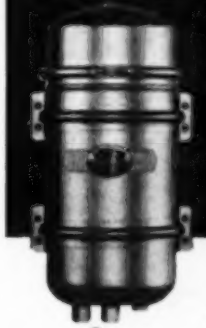

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- **Positive Sealing Gasket**—Long lasting "O" ring type gasket assures leak-proof lid closure at all operating pressures.
- **New Type Internal Design and Construction**—Provides multiple seal to eliminate the possibility of oil bypassing the Luber-finer pack.
- **Dual Safety Valves**—Prevents oil drainback, assuring exact crank case oil level reading at all times, stops oil from circulating through unit if lines are reversed or if Luber-finer is otherwise improperly installed.
- **One-Piece Extruded Steel Housing**—Plus rugged mounting brackets insures durability and long, trouble-free operation.
- **Time-Tested Patented Filtering Process**—*Only* in genuine LUBER-FINER PACKS—the exclusive patented filtering process proved by millions of satisfied users.

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To the Employee Relations Director of every American company

LET'S FACE IT . . . the threat of war and the atom bomb has become a real part of our life—and will be with us for years. Fires, tornadoes and other disasters, too, may strike without warning.

The very lives of your employees are at stake. Yours is a grave responsibility. Consider what may happen.

When the emergency comes, everybody's going to need help at the same time. It may be hours before outside aid reaches you. The best chance of survival for your workers—and the fastest way to get back into production—is to know what to do and be ready to do it. To be unprepared is to gamble with human lives. Disaster may happen TOMORROW. Insist that these simple precautions are taken TODAY:

☐ **Call your local** Civil Defense Director. He'll help you set up a plan for your offices and plant—a plan that's safer, because it's entirely integrated with community Civil Defense action.

☐ **Check contents** and locations of first-aid kits. Be sure they're adequate and up to date. Here again, your CD Director can help—with advice on supplies needed for injuries due to blast, radiation, etc.

☐ **Encourage personnel** to attend Red Cross First Aid Training Courses.

☐ **Encourage your staff** and your community to have their homes prepared. Run ads in your plant paper, in local newspapers, over TV and radio, on bulletin boards. Your CD Director can show you ads that you can sponsor locally. Set the standard of preparedness in your plant city. There's no better way of building prestige and good employee relations—and no greater way of helping America.

Act now . . . check off these four simple points . . . before it's too late.

SPACE FOR THIS **CIVIL DEFENSE** MESSAGE CONTRIBUTED BY

R. F. Stedman

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

New Fuel Oil Filter

American Bosch is now producing a new and improved fuel oil filter for final-stage use on diesel engines. Designated as Type FSA-10A-1, the filter removes from fuel oil the last tiny particles of dirt which, although microscopic in size, can cause expensive wear on the internal lapped surfaces of diesel fuel injection equipment.

Utilizing an improved, denser type of filtering material, the FSA-10A-1 filter removes abrasive particles down to those less than two microns in size, and this filtering efficiency improves with use. The filtering element is water resistant so that if any water should be present in the fuel oil the filter's effectiveness will not be impaired.

It is of sealed construction to provide the utmost protection against entrance of dirt into the fuel supply system when it is replaced. As an additional safeguard, a built-in check valve is provided to prevent the possibility of incorrect installation as regards direction of oil flow. Fuel oil can pass through the filter only in the direction in which the filtering action is most effective. The American Bosch FSA final-stage fuel oil filter has ample capacity for all medium size truck, bus and tractor engines and is especially valuable in dusty areas or wherever special circumstances create dusty conditions. For larger industrial engines, two filters can be installed in parallel hook-up.

Florida Dealership Opens

Operated formerly as a service branch of Florida Diesel Engine Sales, a factory branch of Detroit Diesel Engine Division of General Motors, Southern Diesel Sales, 529 Palm Beach Blvd., will now be the Ft. Myers, Fla., dealer for GM diesels. Southern Diesel Sales will be under the ownership and management of Roy T. Sorrell, Jr. Mr. Sorrell has had wide experience in the sales and servicing of GM diesel engines as the partner in a GM diesel distributor organization in another location.

Administrative Assistant

William E. Butts, president of General Metals Corp., San Francisco, announces the appointment of William F. Harper as administrative assistant to the president. Mr. Harper was formerly with Consolidated Vultee Aircraft Co. in San Diego and prior to that with Allan B. Dumomont Laboratories in East Patterson, N. J. He is a graduate of Newark College of Engineering.

Dieselization Grows

The growing use of diesel motive power by American railroads is shown by the following figures, supplied by the Interstate Commerce Commission's Bureau of Transport Economics and Statistics: in the first four months of 1954, 83.35% of freight traffic, 84.92% of passenger traffic and 88.93% of yard switching operations were handled by diesels. Missouri Pacific Lines provides a good example of railroad dieselization. Nearly all Missouri Pacific operations are performed by diesels, the only exceptions being the Illinois coal field and a few branch lines.

Assistant to Vice President

The Read Standard Corp. recently expanded its sales engineering facilities with appointment of Frank W. Quiggin as assistant to vice president—sales in its Blower-Stoker Division sales headquarters in New York. Prior to his appointment, Mr. Quiggin was a mechanical engineer with Cooper-Bessemer Corp., Mt. Vernon, Ohio, where he was associated with application engineering related to diesel engines, gas engines and motor-driven compressors.

Mr. Quiggin is an engineering graduate of the North Gloucestershire Technical College in England. During World War II he served six years as a technical officer in the engineering branch of the Royal Air Force Volunteer Reserve, and was appointed to the rank of squadron leader. Following his military service and prior to his coming to America in 1948, he spent a year as chief test administrator of the De Havilland Propeller Co., Hatfield, England. Mr. Quiggin's efforts will be under the direction of Charles J. Surdy, vice president—sales.

Promotions Announced

A number of personnel promotions in Stewart & Stevenson Services, Inc. branches throughout Texas have been announced by Joe Manning, vice president and general manager. These changes have been made to improve service to the customer and increase the engineering and application ability of the Stewart & Stevenson sales organization, Mr. Manning said.

E. E. Childress, who has been sales manager of the Odessa branch for the last three years, has been transferred to the main plant at Houston where he will serve as chief engineer. Mr. Childress has been with Stewart & Stevenson for eight years. He received his degree in mechanical engineering from Texas Tech in 1942 and served in the U. S. Navy during World War II.

N. J. "Tiny" Herman has been transferred from the engineering department in Houston to the petroleum industry sales department for the Houston territory. Grady Foster has been transferred to the Lubbock branch.

New Caterpillar Dealer

Honnen Machinery Co. of Blythe, Calif., has been named Caterpillar dealer for the Blythe, Parker and Needles areas, replacing Hartnett Machinery Co. Hugh Honnen, president of the organization, has had 35 years of experience with agricultural and earthmoving machinery.

the static seal story

complete coverages as indicated by these sub-headings

- THE STATIC SEAL PROBLEM
- APPLICATION OF THE SELF-ENERGIZED METALLIC O-RING
- DESCRIPTION OF THE SELF-ENERGIZED METALLIC O-RING
- ENGINEERING DESIGN DATA
- MECHANICAL BACK-UP
- O-RING SQUEEZE
- SURFACE FINISH
- COMPRESSION LOADS REQUIRED TO INSTALL
- RESILIENCE
- LIMITATIONS — PRESSURES — TEMPERATURES
- CORROSION RESISTANCE
- DESIGN LIMITATIONS
- SUMMARY

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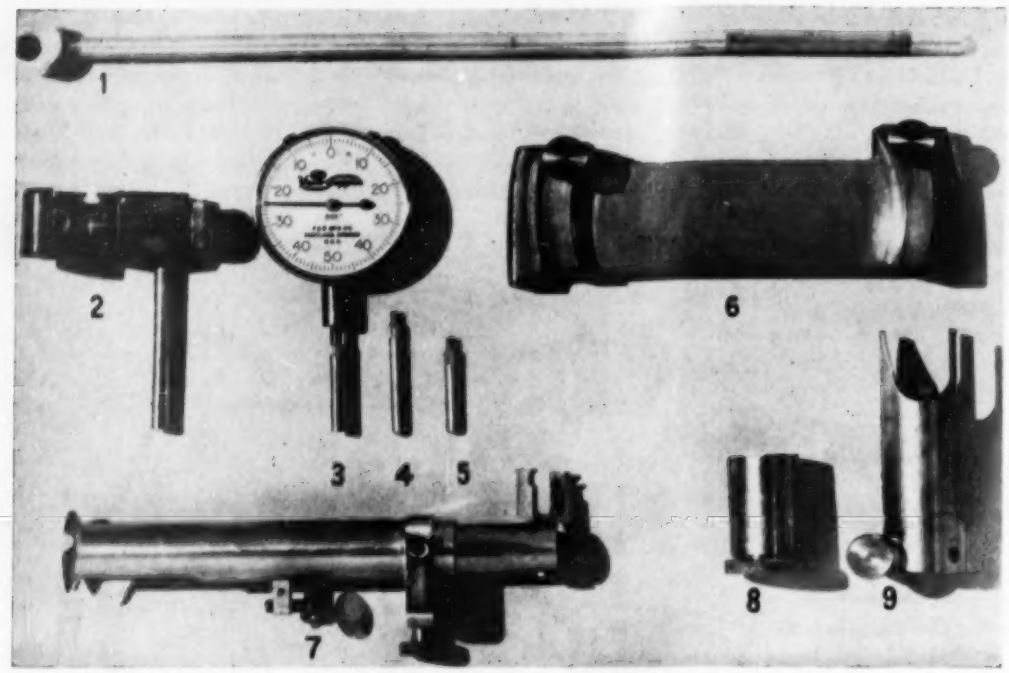
New P&G Valve-Gapper Overhaul Kit



(A) P&G valve-gapper overhaul kit for GM-71 series diesel engines. The complete set includes (1) dial indicator handle, (2) "D" engine control tube adapter, (3) dial indicator, (4) standard-cylinder bore, (5) standard-cylinder liner, (6) combination master gauge and holder, (7) valve-gapper, (8) micrometer plug gauge and (9) timing attachment. Other photos show how the kit is used.

A new P&G valve-gapper overhaul kit, specifically designed for GM-71 series diesel engines, not only includes instruments for setting valve clearance, timing fuel injectors and balancing fuel injector racks, but also provides adaptors for micrometer accurate measurement of height of cylinder liners, uniformity of counterbore, uniformity of cylinder bore and cylinder liner wear when overhauling or rebuilding GM diesels.

All these measurements register on a dial indicator which the mechanic can see during all phases of the operation.

Basic precision instrument of the kit is the model 201 valve-gapper used for setting valve clearance, timing fuel injectors and balancing fuel injector racks. The kit includes the model 201 set and is the latest development of the P&G Manufacturing Co. of Portland, Ore., which has succeeded in taking the "feel" out of setting valve gap with its precision instruments. The model 201 is already being used extensively, according to the manufacturer, and it can also be used to set clearance on GM 6-110 engines. Adaptors soon will be available for timing injectors and balancing fuel racks on these engines.

Immediate shipment . . . no waiting or delays in receiving your reconditioned cylinder head.

Heads available for most popular makes of diesel engines.

Guaranteed as good as new and up to the manufacturer's original specifications.

Surprisingly low cost. You pay only for restoration and shipping.

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When extended downtime means a serious business loss, call or wire Guth-Pascoe. Guth-Pascoe offers immediate exchange service on most popular diesel engine cylinder heads . . . fully reconditioned, completely guaranteed, ready for instant shipment by the fastest means possible. You get full credit for your old cylinder head upon its return. You pay only the cost of restoration and shipping charges.

The GUTH FUSION PROCESS is a scientific system of rebuilding broken and cracked castings. Developed and patented in many of its phases by Carl R. Guth, its use is supervised every step of the way by a specially trained expert. Do not discard that old cylinder head. It can be replaced at a small fraction of its original cost. When you have a problem, it will pay you to consult Guth-Pascoe.

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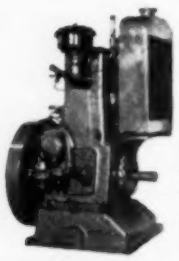
Small Diesels



MODEL "ADRS"

WITTE VERTICAL ENGINES

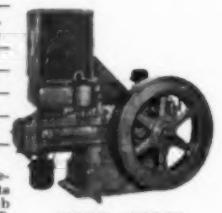
MODELS	CONT. H.P.	COOLING	MAX. RPM
"ADTS"	4.0	Tank	1200
"ADRS"	3.75*	Radiator	1200
"LDTS"	9	Tank	1350
"LDRS"	8.6*	Radiator	1350

*Lower rating due to power required to operate fan. Units can be equipped with stub shaft or clutch power take-off.

WITTE HORIZONTAL ENGINES

MODELS	CONT. H.P.	COOLING	MAX. RPM
"BDTS"	8	Tank	900
"BDRC"	7.8*	Condenser	900
"CDTS"	12.5	Tank	750
"CDRS"	12.2*	Condenser	750

*Lower rating due to power required to operate fan. Units can be equipped with stub shaft or clutch power take-off.



MODEL "BDRC"

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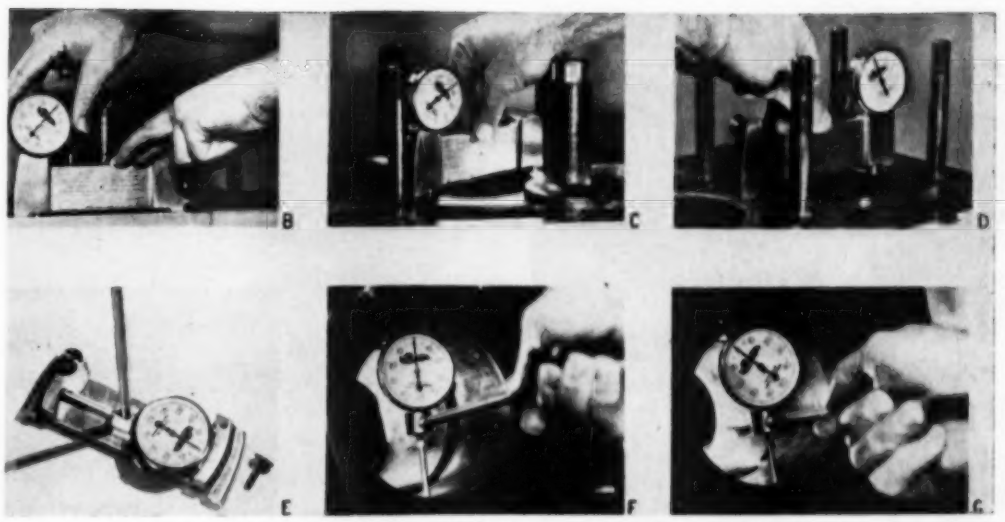
UNITED STATES STEEL

The valve-gapper and its adaptors are easy to use. For example, to adjust valve gap the instrument is placed on the valve spring retainer and held firmly between it and the rocker arm by spring pressure. The valve gap is then closed by hand pressure and the dial indicator needle adjusted to zero. Pressure is then released and the clearance registers on the dial. Using both hands, the mechanic then adjusts the gap in the normal manner until the needle points to the recommended clearance.

This new principle in setting valve clearance, quicker and more accurate than by the feeler gauge method, is micrometer accurate; the instrument measures the entire travel of the rocker arm prior to contact with the valve stem. Timing fuel injectors and balancing fuel racks are equally accurate and simple to do.

The complete GM diesel overhaul kit is pictured here. Model 201 valve-gapper comes in a sturdy wood tool case and the kit is separately packed in another case. P&G valve-gappers are now available for most makes of gas engines with overhead valves. Models for other makes of diesels are being field tested. The new GM overhaul kit and model 201 set are available for immediate delivery.



(B) Measuring height of cylinder liner. Mechanic places dial indicator in high side of master gauge, tightens set screw and places master gauge on a smooth part of block. Zeros dial indicator needle by turning dial rim. (C) Positions gauge across cylinder with feet on block and dial indicator rack on cylinder liner rim. Dial registers proper height of liner in relation to cylinder block. (D) Measuring uniformity of counterbore. Mechanic places dial indicator on low side of master gauge, sets gauge across cylinder bore with dial indicator rack resting on bottom of counterbore, then sets dial to zero and rotates gauge, checking as many points as desired. (E) Measuring cylinder bore. Mechanic screws No. 4 standard into indicator rack, places handle on dial indicator and sets dial indicator in master gauge, as shown, with all three points touching. He then sets needle to zero. Master gauge is exact diameter of cylinder bore. (F) Mechanic then lowers dial indicator into cylinder bore, using rocking motion to find minimum diameters. (G) Measuring cylinder liner wear. Mechanic changes standard to No. 5. Using new liner, or top edge of liner being measured, as a gauge, he sets dial to zero, lowers dial indicator into cylinder liner and follows same method as in checking cylinder bore. Dial indicator registers exact wear to .001 in. in both operations.

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STEEL
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CORRECTING MISALIGNMENTS
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SEAMLESS OR INTERLOCKING CONSTRUCTION
BRONZE, STEEL, STAINLESS STEEL—⅛"-36" I.D.
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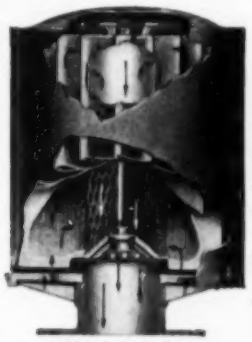

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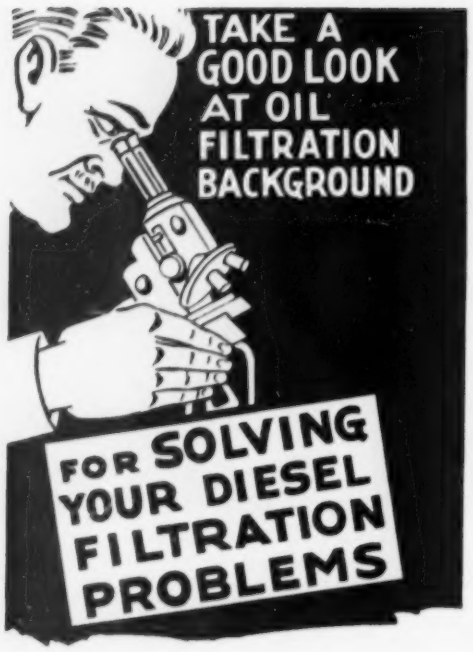
ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED



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NATION-WIDE RESEARCH, ENGINEERING AND CUSTOMER SERVICE. WRITE US about your problems . . . take full advantage of over a quarter of a century of oil filtration experience.

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DEPT. 36, RIVER ROAD
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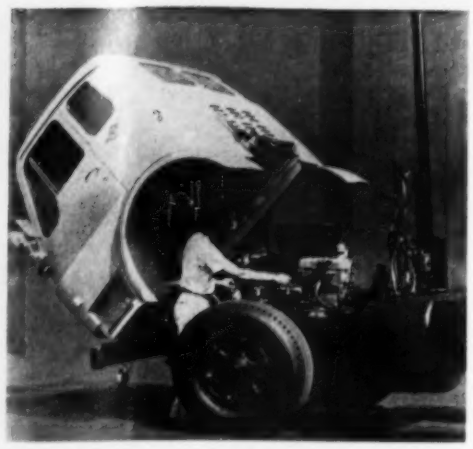
Diamond T Model 723C in Production



The 723C tilt-cab tractor provides complete and instant accessibility to entire engine area. Cab is counter-balanced and tilts by hand in a few seconds.

Heralded by its manufacturer, Diamond T Motor Car Co. of Chicago, as the "lightest C.O.E. diesel in the industry" is the new 723C tractor, a tilt-cab model developed to cut costs and increase profits for haulers handling payloads in the 18-20 ton range with tandem axle semi-trailers. According to Z. C. R. Hansen, Diamond T's director of sales, the new model provides about 2000 lbs. of extra payload capacity under common legal restrictions and saves around two cents a mile in fuel cost when compared to conventional gas tractors in this field.

In model 723C Diamond T engineers present the first development of a full C.O.E. tractor with the lightweight, supercharged Cummins JBS diesel engine. It develops 150 bhp. at governed speed of 2500 rpm. The new Cummins PT fuel pump (described in detail in the September issue of DIESEL PROGRESS) is standard.

Successful application of the JBS in a full C.O.E. tractor is credited to the tilt-cab design which eliminates problems of accessibility. The complete cab, cowl and fender assembly tilts forward manually in a matter of seconds, exposing the engine, clutch and transmission at bench height. A simple set of counter-balancing springs provides the power to lift the cab, which works on the same principle as a tilting garage door. Controls are not disturbed when the cab is lifted. A large floor section remains stationary.

Diamond T model 723C diesel tractor complete with 106-gallon saddle tank, trailer connections and fifth wheel—ready for the road. New Cummins PT fuel pump is standard.

For Dependable Lubrication in **Tough Service**

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FORCE FEED LUBRICATORS

Engineered to the Specific Needs of Your Particular Diesels

Manzel

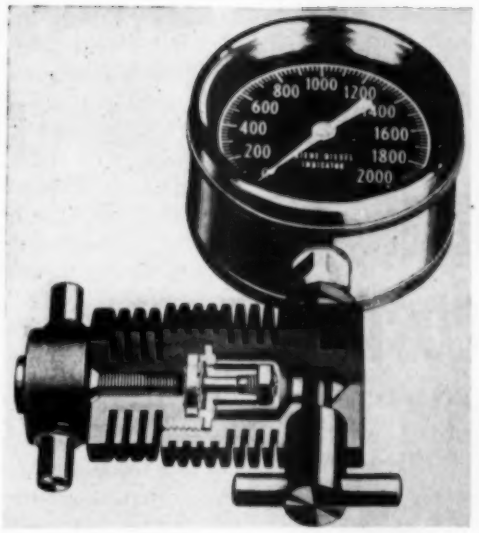
DIVISION OF FRONTIER INDUSTRIES, Inc.
275 BABCOCK STREET, BUFFALO 10, NEW YORK

The cab is 84 in. in over-all width and is of all-steel construction. The windshield has a total area of 1850 in.; the driver's seat is provided with a 4-way adjustment. In addition to the JBS Cummins diesel engine, major specifications include a Lipe 14-in. single plate clutch; Clark 292VO heavy-duty 5-speed overdrive transmission; Timken FE-900 front and Eaton 18803 2-speed rear axles, with Westinghouse air brake system. The 723C has a gross combination weight rating of 60,000 lbs., yet its base chassis weight is only 9350 lbs., of which less than 3100 lbs. is at the rear axle. Standard wheelbase is 111 in., with an optional 99-in. wheelbase available for special conditions.

In model 723C Diamond T engineers have provided an option of several single-speed rear axles with the Fuller 8-speed R45 transmission, which provides performance comparable to the 2-speed axle and 5-speed transmission. Options include the Eaton 1893, the Eaton 1911 and the Timken hypoid R100. Standard fuel tank is of 30-gallon capacity, side-mounted at left in back of the cab, but a 106-gallon Snyder saddle tank is available as an option.

Equipment Distributors' Conclave

One of the diesel industry's most important annual business conclaves—the 1955 convention of the Associated Equipment Distributors—has been set for Jan. 23-28 at the Conrad Hilton Hotel, Chicago. Some 2500 distributors and manufacturers attended the 1954 convention in New York City. The AED is the trade association of the construction equipment industry.



ACCURATE, SIMPLE—The Kiene diesel indicator for checking diesel engine compression and firing pressures is equipped with a precision gauge for direct pressure reading. (For details of its use, see page 34 of this issue dealing with the General Motors portion of the power plant for the aluminum smelter at Corpus Christi, Texas.) This diesel indicator is made by Kiene Diesel Accessories, Inc., Franklin Park, Ill. It is equipped with a tapered plug and wing nut connector adaptable to standard indicator cocks, has only one moving part and maximum pressure is indicated on the gauge until released by the operator. It is not affected by heat, is compact (weighs less than 10 lbs.) and easy to use and service. Its frequent use insures prompt detection of minor abnormalities in the operating conditions of a cylinder.

CHANNELCROMIUM,

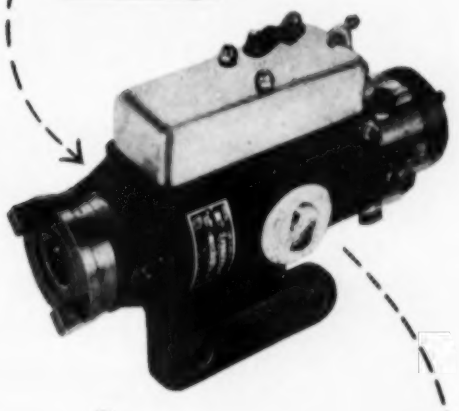
illustrated above at 50 diameters, on the liner bores of one of America's finest Diesel-electric road type locomotives, is showing no measurable wear, no sign of a ring step at the outer end of the piston ring travel, in three years of main-line operation, with low lubricating oil consumption.

BULLETIN SOON,
On Channelcromed Diesel Engine Liners.

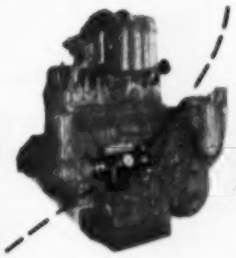
PENNINGTON CHANNELCROMIUM CO.

319 Dakota Street **San Antonio, Texas**

this revolutionary pump



makes good diesels better!



Perfected after 15 years of research and intensive field experience, the Roosa Master is a revolutionary development for better and simplified fuel injection. Performance-proven... simple... compact and lightweight, Roosa Master offers to both diesel engine manufacturers and users such advanced features as: built-in governor that gives extremely close speed regulation, built-in transfer pump, complete self-lubrication... plus the elimination of complicated springs, poppet valves, ball bearings and gears. Not limited on high speed applications and easy to service right in the field, Roosa Master pays big dividends (to your diesel customers) in high performance, low maintenance cost, and long life. For the very best in diesel engine performance, specify Roosa Master, made by one of New England's leading manufacturers of precision machined products. Complete information is available from the Hartford Machine Screw Company, Hartford 2, Conn., or your engine manufacturer.

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- LOWER ORIGINAL COST
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- NO EXPENSIVE BACK UP SUPPORT REQUIRED
- PERMANENT TYPE
- HIGH FLOW RATE (EITHER DIRECTION)
- EASILY CLEANED

It seems hard to believe, but you can actually have more efficient filtration at considerably lower cost if you simply use Bendix-Skinner ribbon elements instead of expensive and less adaptable metal edge or metal screen types.

Here's how it works— Bendix-Skinner ribbon elements are inexpensive to begin with and can be installed at far less cost than metallic elements that require special back-up supports. In fact, in practically every instance present metallic-type elements can be changed over to ribbon-type with substantial savings.

Ribbon units are available in diameters from ½" to 6" in any required length with filtration rated at 40 microns (.0016").

Our engineering department will be glad to advise on new installations or to furnish replacement units in a variety of sizes. Write us for details.

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ORIGINATOR OF **MICRONIC** FILTRATION

BENDIX-SKINNER DIVISION OF Bendix

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Export Sales: Bendix International Division, 205 East 42nd Street, New York 17, N. Y.

Folder on Catalytic Exhausts

OCM catalytic exhausts for removing harmful exhaust fumes from internal combustion engines in both industrial and commercial equipment are described in a new 4-page folder published by Oxy-Catalyst, Inc., Wayne, Pa. The exhausts are designed for engines burning diesel, LPG or non-leaded gasoline.

Types of equipment which can benefit from OCM catalytic exhausts, and some examples as listed in the folder, are: in-plant equipment (materials handling trucks, power sweepers, portable welders, and stationary engines); mining and construction equipment (diesel locomotives, shuttle cars, dump trucks, tractor shovels, bulldozers and graders); dieselized boats and barges; and over-the-road diesel or LPG trucks and buses.

Illustrated are the compact catalytic units built into the exhaust chamber for oxidizing dangerous carbon monoxide and hydrocarbons, noxious fumes and odors before they reach the air.

OCM catalytic exhausts take the place of standard mufflers and, as pointed out in the folder, can be quickly and easily installed by any mechanic. They are made to give up to 2000-2500 hours of trouble-free service, after which the catalytic units can be economically replaced.

Massive Dynamometers in Use

A 10,000 hp., high-speed, eddy current absorbing dynamometer, recently shipped by the Dynamatic Division of Eaton Manufacturing Co., Kenosha, Wis., will be used with another unit shipped a number of years ago, to provide test facilities to 20,000 hp. The units have a speed at this horsepower of from 600 to 5800 rpm. The combination is one of the largest high-speed dynamometer installations ever built. To permit runs to 15,000 rpm., a gear reducer is located between the unit under test and the dynamometers. The three units, the gear reducer and the two dynamometers, are mounted in trunnion bearings so that the torque developed can be read on acutely accurate weighing instruments.

Features of the dynamometer are many: (1) The gear reducer permits speeds up to 15,000 rpm. (2) Total torque of the two dynamometers at 600 rpm.: 175,000 lbs. ft. (3) Total torque at 5800 rpm.: 18,000 lbs. ft. (4) Water required to cool both dynamometers when absorbing 20,000 hp. will be 2000 gallons per minute, or 2,880,000 gallons per day. (5) The electronic control will supply 36 kw. of dc. current which will accurately control the torque and speed. Each unit has 14 large circular wound coils. The total (28 coils), requires 4000 lbs. of copper. Length of wire used is 37 miles. (6) The rotor and shaft is one homogeneous piece of steel made from a forging which has been checked by ultrasonic instruments to detect flaws. (7) The active part of this solid rotor is 36 in. in diameter, 80 in. long, and weighs 26,000 lbs. (8) Centrifugal stress in the rotor at 5800 rpm. is 37,000 lbs. per square inch. Speed at which a rotor of this size will reach yield point of steel is 9800 rpm. (9) The bearings are of the sleeve type, 11 in. in diameter, and 11 in. long. Bearing pressure per square inch is 260 lbs. Bearing speed is 280 ft. per second, or 190 miles per hour. The heat produced by the bearings at 5800 rpm. of each dynamometer is 372 hp. This heat is carried away from the bearings by oil flowing at the rate of 45 gallons per minute. (10) Total weight of the two dynamometers and the gear is about 220,000 lbs. In order to facilitate handling at the site, it was necessary to ship these dynamometers knocked down. The total shipping weight of the last unit was 84,000 lbs.

Diesels for Towboat

Baldwin-Lima-Hamilton Corp., Hamilton, Ohio, has been awarded the contract to furnish two marine propulsion diesels for the Ohio River Co.'s new towboat *Mike Creditor*. The two supercharged engines are Baldwin model 606-SC, 12¾-in. by 15½-in., 6-cylinder, 4-cycle units each rated 1,080 bhp. at 600 rpm. Each engine will drive an individual propeller at 240 rpm. through Falk reverse and reduction gears having a ratio of 2.5:1. The engines and reduction gears will be arranged for complete pilothouse control. The *Mike Creditor* will be built by the St. Louis Shipbuilding & Steel Co.

Locomotive Installations

U. S. railroads placed 842 new locomotive units in service in the first seven months of this year, according to a report by Missouri Pacific Lines. Of that number, 832 were diesel-electric units — 64 were for Missouri Pacific — and the other 10 were gas turbine-electric units. In the same period of 1953, 1409 new units were put in service. Of this number 1398 were diesel-electric, 10 were steam and one was gas turbine-electric.

Mid-Continent Diesel News

By Jack F. Cozier

STELBAR OIL CORP., Wichita, Kan., has recently purchased a Murphy model 122 diesel engine from the Manufacturer's Distributing Co., Great Bend, Kan. The 190 hp. unit will be used for powering 7¼ by 12 Gardner-Denver slush pump for rig drilling in Cowley county.

GROSECLOSE Construction Co., Oklahoma City, has purchased an Adams 660 scraper powered by a Cummins HBI-600 engine for use at Prague, Okla. The unit was sold by Cummins Sales and Service, Oklahoma City.

BUDA ENGINE and Equipment Co., Tulsa, has sold four 8MO-1290 Buda gas engines to be used to power water pumps for irrigation in Kansas.

S & S CONSTRUCTION Co., Ponca City, Okla., just bought two IH 2T-55 hauling-scraper rubber-tired tractors powered with Cummins HRB-600 diesel engines. The tractors will be used for highway construction.

PRODUCERS CHEMICAL Co., Borger, Texas, has purchased a GM model 62-403 diesel engine to be used on a high-pressure well treating pump from Diesel Power, Inc., Plainview.
DULANEY MINING Co., Grand Junction, Colo., has purchased a Murphy model 20 generator set. The 90 kw. unit provides all electrical power for a Colorado uranium mining camp.

TED WADE Drilling Co., Drumright, Okla., has just bought a Cardwell rig equipped with two Cummins NHI-600 diesel engines powering the drawworks and a Cummins NHRIPS-600 diesel engine powering a Gardner-Denver pump. The rig will be used at Kaw City, Okla.

CLARK BROS. CO., Tulsa, has sold an HSRA-3 gas compressor to be used in a gasoline plant in Skellytown, Texas. It develops 400 hp.

LOYD BOATWRIGHT, Alex, Okla., purchased an Autocar DC75TRBB truck powered by a Cummins HRBB-600 for highway hauling.

WESTERN PAVING Construction Co., Denver, has just purchased a model 122 Murphy diesel for powering a new Cedarapids rock crusher. The plant will be located at Kimball, Neb.

SERVTEX MATERIALS Co., New Braunfels, Texas, is a Cummins dieselized company. This large limestone quarry and rock crushing plant operates six Euclid trucks powered with Cummins HBID-600 engines and one GE locomotive with two Cummins NHBIS-600 engines.

SOUTHERN Oklahoma field gas transmission lines are making use of two new Buda gas engines, model 6MO-970 and model 6MO-893, on portable gas units.

HALLIBURTON Oil Well Cementing Co., Duncan, Okla., now employs over 200 Cummins diesels to power trucks, cementing pumps on both highway and marine vehicles, and various other items of industrial equipment.

GLENN BURGESS, Tulsa, has purchased a GM model 4051 diesel engine to power a 4-in. centrifugal pump for irrigation north of Mohawk park in Tulsa. The unit was sold by Diesel Power Co., Tulsa.

New Exchange Service

A new exchange service for used crankshafts has developed on the West Coast in the past two years. The Motorshaft Replacement Co. of 3349 Union Pacific Ave., Los Angeles, is the West Coast distributor for Morco division of Ohio Crankshaft Co., Bedford, Ohio. This unique service offers factory reconditioned crankshafts with a certificate of guarantee in exchange for used crankshafts with good cores that are suitable for reconditioning. The exchange units are put through a rigid reconditioning process.
This process includes six separate magnaflux inspections; original factory grinding on heavy equipment; a "double grind" process such as is used in the manufacture of original units for the engine builder; "Tocco" hardening; rolled fillets (by a special machine) when indicated in original manufacturer's specifications; dynamic balancing on original factory equipment; and rebuilding of thrust collars and surfaces.

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Compressor Sets
Marine Auxiliary Units
Engine Compressor Sets
Engine Pump Units
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Write us for complete information. Our generator sets and power units are described in the DIESEL ENGINE CATALOG.

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INVENTORY
of diesel parts, engines, generators and electrical equipment

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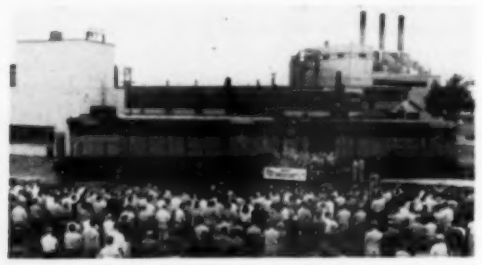
F-M Anniversary Celebration

V. H. Peterson, vice president of Fairbanks-Morse railroad division (right), presents key to new locomotive to L. H. Donald, vice president of operations for Milwaukee Railroad. F. W. Bunce, general superintendent, stands between them and W. E. Watson, general manager of F-M's Beloit plant, is on the steps of the engine.

Fairbanks, Morse & Co. and Milwaukee Railroad officials joined recently in celebrating the 10th anniversary of the building of the first Fairbanks-Morse diesel locomotive. The occasion took place at F-M's Beloit Works where Milwaukee Railroad officials accepted one of the new 1600 hp. Fairbanks-Morse all-purpose locomotives, part of a recent order for a number of these engines. Some 1000 F-M employes attended.

The original locomotive, built and sold to the railroad in 1944, was on hand to pull out of the shop the shiny orange and black diesel locomotive just completed. Following a welcoming speech by W. E. Watson, general manager of the Beloit Works, V. H. Peterson, vice president of F-M's railroad division, welcomed a group of Milwaukee Railroad officials and presented to L. H. Donald, vice president of operations, the key to the new locomotive.



Employes of Fairbanks, Morse & Co. look on as Milwaukee Railroad officials accept delivery of new locomotive marking 10th anniversary of the building of the first Fairbanks-Morse diesel locomotive. The first diesel, sold to Milwaukee in 1944, is shown at right, next to the shiny new 1600 hp. F-M all-purpose engine—one of several ordered recently by Milwaukee.

Technical Bulletin Available

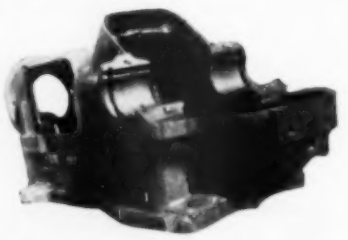
Written for everyone interested in the lubrication of diesels, Sun Oil Co.'s technical bulletin "Lubrication of Diesel Engines" has been revised and updated. Generously illustrated, it discusses diesel principles and design, types of engines in use, operating cycles, engine accessories and the choice of the correct diesel lubricants. A quick-reference trouble-shooting chart lists remedies for faulty performance.

Free copies of "Lubrication of Diesel Engines," Technical Bulletin B-1, may be obtained by writing to Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa. In Canada, the source is Sun Oil Co., Ltd., 600 University Ave., Toronto 2.

. . . we took this shattered compressor and put it back to work

We were called in to look at this damaged unit after the owner had pretty much decided it would have to be replaced. This simple consultation saved him a large part of the replacement cost.

YOUR CASTINGS CAN BE REPAIRED!
Southern Welding & Engineering Company can save you money. We specialize in solving the "tough" problems. No matter how badly broken or intricate the casting, you can be sure that it will give you "as new" performance and life after Southern Welding & Engineering Company completes its repairs.



Let our repair specialists show you how to "put it back to work."

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Insist on VELLUMOID for Quality
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FOR OIL, WATER AND GASOLINE
THE VELLUMOID COMPANY WORCESTER 8 MASS.

West Coast Diesel News

By James Joseph

TO LOS ANGELES' Silvia & Hill Construction Co., a DW-21 tractor with modified scraper, its bowl extended 18½ in., allowing a 27-cu.-yd. maximum load. Redesign by Shepherd Tractor and Equipment Co.

A MODEL TR-9 Mixermobile powered with a 6DT-468 Buda has been delivered by Hamilton Engine Sales, Inc., Portland, to H. G. Campbell for use on his farm near Echo, Ore.

TO REPLACE a sawmill engine at one of its operations, Aborigine Lumber Co., Longview, Wash., has purchased a 6DC-844 Buda industrial type power unit.

REPOWERING Eugene Overton's *Tiara,* a GM 4-71 marine engine delivered by San Pedro, Calif.'s Crofton Diesel Engine Co., Inc.

LACY OIL TOOL CO., Long Beach, Calif., a GM 4-51 diesel, through Crofton Diesel Engine Co., Inc. of San Pedro.

RECENTLY DELIVERED to Ed Hoeft, Pendleton, Ore., a new model TR-6 Mixermobile powered by a 6DT-317 Buda, for farming in the Pendleton area.

ANOTHER BUDA, this time a 6DAS-516, 165 hp. engine, powering a TR-14 Mixermobile, has turned agricultural for Roy Temple of Echo.

TO POWER TWO of its shuttle boats, San Pedro's H-10 Water Taxi Co., Ltd., has purchased two GM diesel marine engines, a GM-3-71 and a 6-110.

R. M. EIDSON has replaced Ned K. Rosenblatt as sales promotion manager of Los Angeles' Shepherd Tractor and Equipment Co., while also continuing as general personnel manager. Mr. Rosenblatt has joined a local advertising firm. Meantime, Frank M. Neff has been named Shepherd's manager of credit controls, a post Mr. Rosenblatt also formerly held.

Reusable Hydraulic Hose Coupling

Eastman Manufacturing Co., Manitowoc, Wis., announces a new 2-piece reusable hydraulic hose coupling, with an exclusive inter-lock grip, for one wire braid cotton cover hose. In response to demands of distributors Eastman engineers came up with an exclusive feature providing a double grip on the hose. Patents for this feature are pending, supported by shipments of the new couplings under their trade name. A new 4-page, 2-color folder describing the coupling and suitable for jobber catalog insertion is available. The folder, Bulletin 105, may be obtained by writing to the Eastman company.

Control Equipment Booklet

Custom Built Controls of 661 Delaware St., Denver, has just published a bulletin that describes and illustrates its standard catalog items which cover most applications in the field of automatic engine control equipment. Twenty items of control equipment are represented. The bulletin points out that special purpose control service is available, including new designs or modifications of standard controls. Copies of the publication may be obtained from the firm.

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To Fill Your Needs For
Trained DIESEL MEN!

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Complete facilities for grinding, plating, Magnafluxing, and electrically-controlled heat-treating.
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HILCO LUBE AND FUEL OIL PURIFICATION FOR DIESEL AND GAS ENGINES . . .

PURIFIERS · FILTERS · RECLAIMERS · CONDITIONERS
THERE'S A HILCO FOR EVERY LUBRICATION AND FUEL OIL FILTERING PROBLEM . . .
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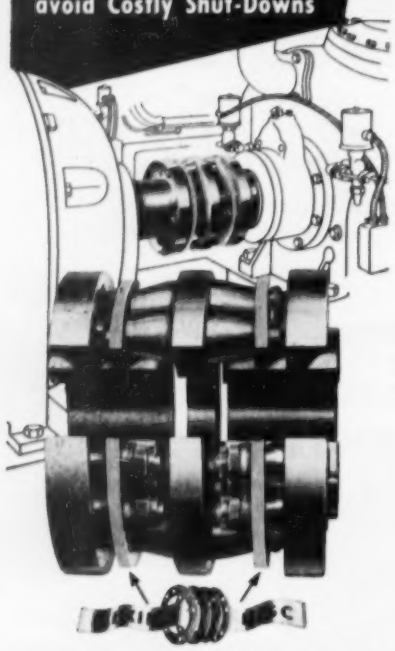
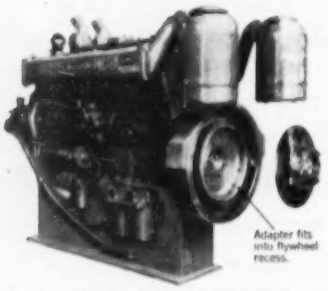
Specify THOMAS ALL METAL
FLEXIBLE COUPLINGS
for Power Transmission to avoid Costly Shut-Downs



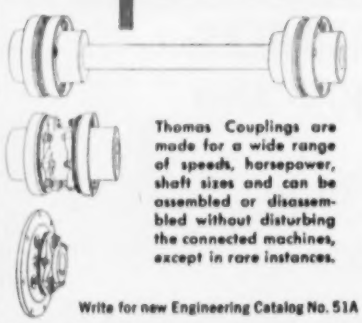
Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.



Typical Flywheel Adapter Application

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Thomas Couplings are made for a wide range of speeds, horsepower, shaft sizes and can be assembled or disassembled without disturbing the connected machines, except in rare instances.

Write for new Engineering Catalog No. 51A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

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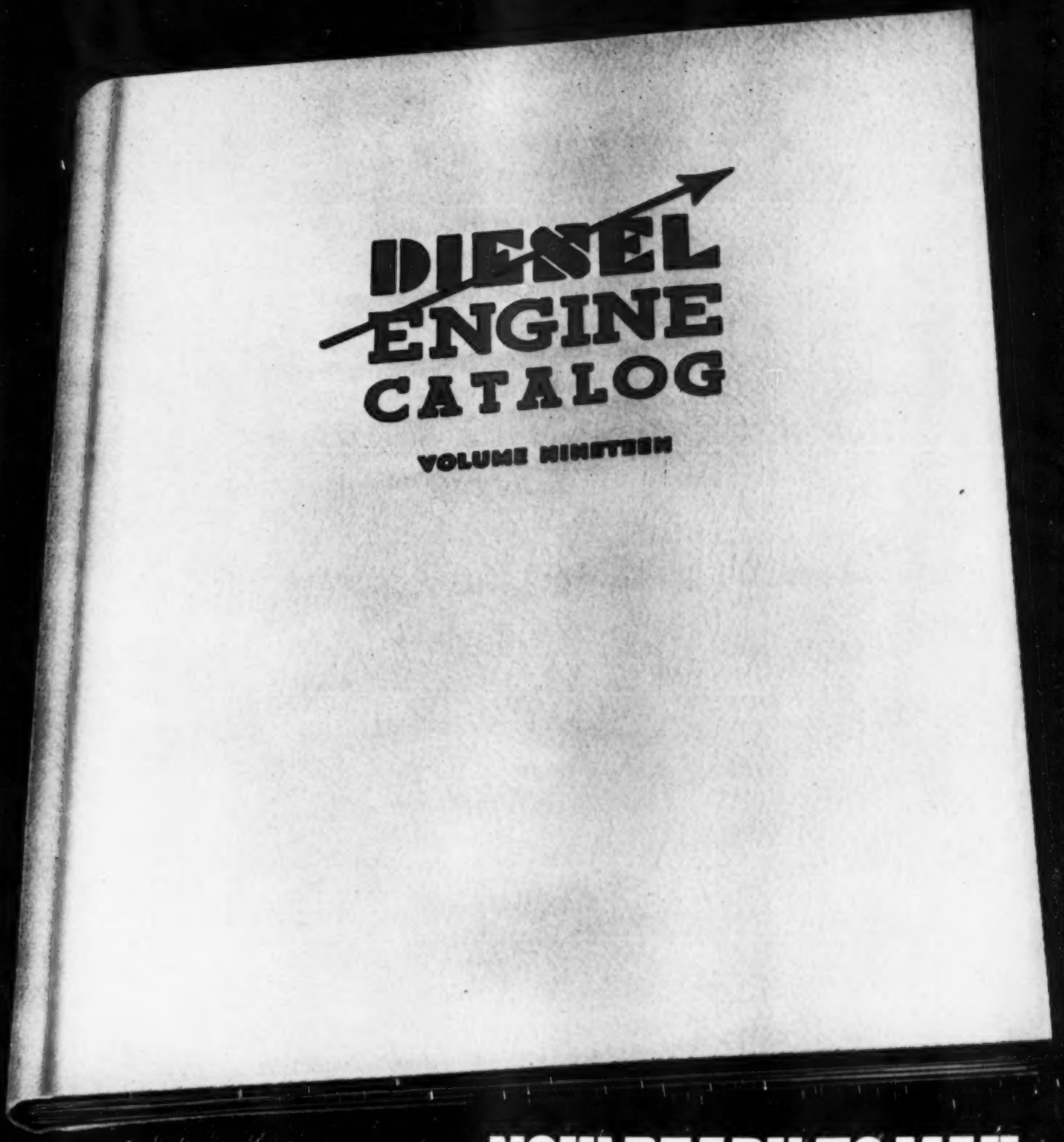

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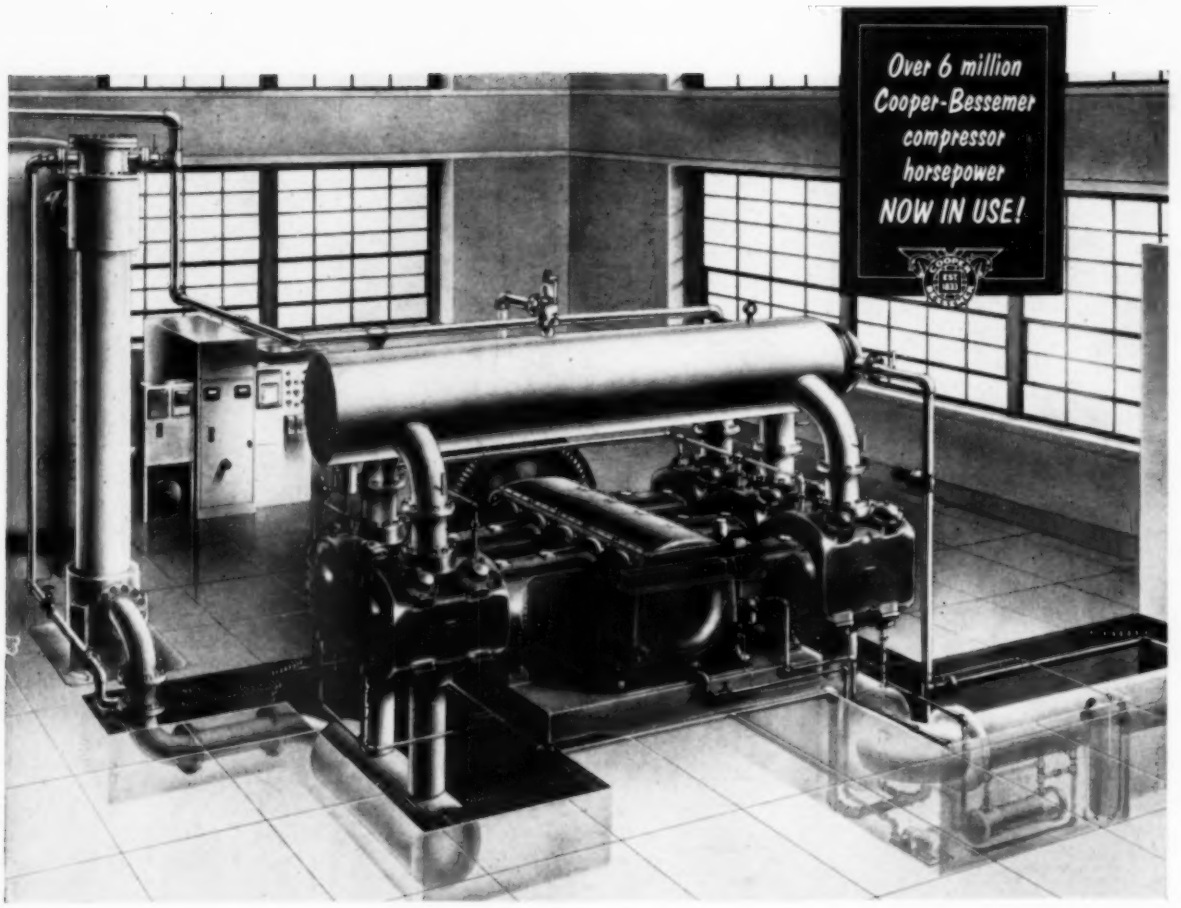

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